FLIGHT

TECHNOLOGY DEPT. MAGAZINE

DECEMBER 1957
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DETROIT

BELL XH-40

(See Annual Helicopter Section)

Royal Swedish Navy Orders Vertol 44's

A special committee of the Swedish Navy made a year-long study of helicopters suitable for anti-submarine warfare as well as utility transportation. In the United States they consulted with headquarters personnel of the three armed services, visited helicopter manufacturers and toured military operating units.

At the conclusion of this intensive study, the Swedish Navy placed an initial order for four of the 22-place Vertol 44's, to be augmented later by additional procurement.

Official Navy announcement of the purchase said the choice was mainly based upon the Vertol 44's "good stability in hovering and towing missions, good instrument flight capabilities and mission endurance . . . practically unlimited controllability for the contemplated missions."

Sweden thus became the fifth western nation to purchase the sturdy Work Horse helicopter, first choice of the experts for the most difficult assignments.

In commercial or military use the Vertol 44 offers these features:

- Highest useful load, largest seating capacity
- Lowest seat mile cost
- Automatic stabilization
- Instrument flight capability

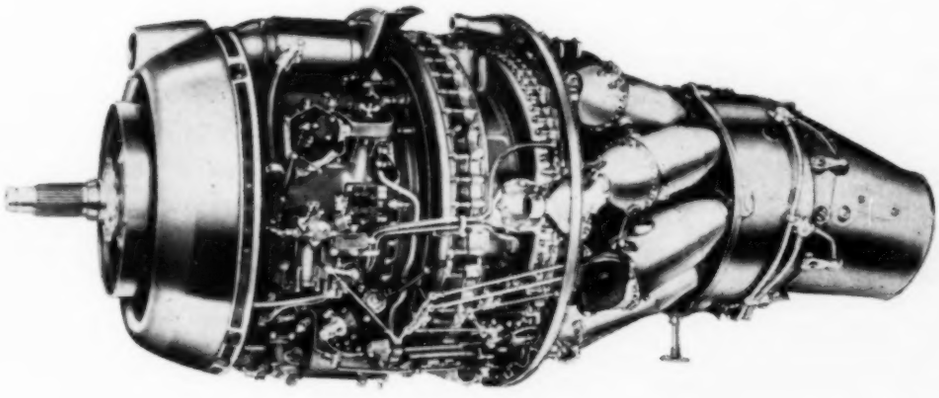
For detailed information write: Customer Relations Manager

VERTOL Aircraft Corporation

MORTON, PENNSYLVANIA

ROLLS-ROYCE
DART
PROP-JETS

POWER THE VICKERS VISCOUNT, THE FAIRCHILD F-27 AND THE AVIATION TRADERS ACCOUNTANT AND HAVE BEEN CHOSEN FOR THE ARMSTRONG WHITWORTH 650 THE HANDLEY PAGE HERALD AND THE GRUMMAN GULFSTREAM



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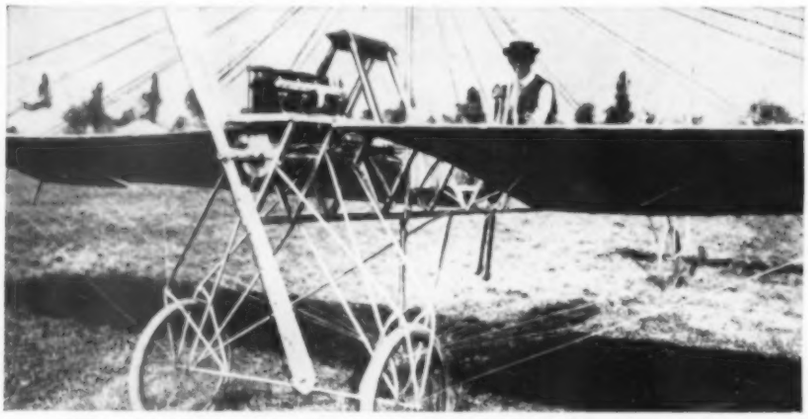
The Many-Sided Career of Early Bird Robinson



Building this 30 h.p. plane in 1908 led to Robinson's meeting with Glenn Curtiss and a long association with this great aviation pioneer.

This early sport plane, designed and built in 1915 by Robinson, attained 81 m.p.h., weighed only 600 pounds.

Hugh Robinson (far left) at the launching of an early Curtiss hydroplane at San Diego in 1911. Glenn Curtiss, designer, is at far right.

Hugh Robinson's skill as a flyer was enough to win him lasting aviation fame; but when you add his abilities as a designer and builder of aircraft, you complete the picture of a many-talented man.

Robinson built a one-cylinder automobile in 1896, a dirigible in 1906 and a tractor-type monoplane in 1908. This airplane led to his meeting Glenn Curtiss. For many years afterward, Robinson helped Curtiss design, build and fly the early and famous Curtiss aircraft.

Robinson was a famous early-day exhibition flyer, making more than 900 appearances here and abroad. He was among the first to fly air mail, making a mail run between Minneapolis and Rock Island, Ill., in 1911. He demonstrated a pioneer dive bombing technique with grapefruit "bombs" in California; operated a flying school in France, and built a sport plane that weighed only 600 pounds.

Altogether, Robinson flew more than 3,000 hours in compiling a useful and enviable record as a daring and resourceful airman.

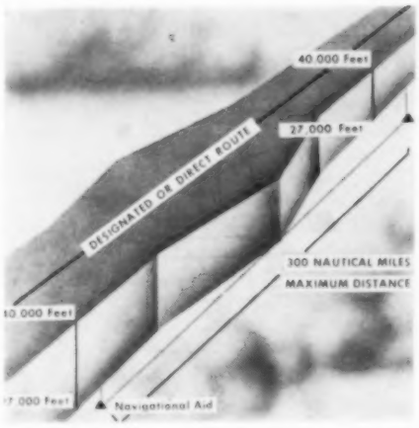
● A pioneer in research and development of aviation fuels, Phillips Petroleum Company is, today, a foremost supplier of high octane gasoline for commercial, private and military aircraft. In step with the future, Phillips is a leading producer of *super-performance* jet fuels for the latest designs in turbo-props and jets. And Phillips research continues to lead the way for development of fuels for the aircraft of tomorrow.

Phillips 66

AVIATION DIVISION • PHILLIPS PETROLEUM COMPANY
Bartlesville, Oklahoma

AIR Report

Significant Trends and News



UNDER NEW CAA HIGH ALTITUDE CONTROL PLAN, existing 10-mile-wide airways lose their identity between 27,000 and 40,000 ft. and are replaced by direct routes between navigational aids located 300 miles apart. Pilots flying direct route receive IFR traffic separation in a space 20 miles wide over the navigational aids and increasing to 30 miles at a point midway between navigational aids defining the route. New plan became effective December 1.
—(CAA Sketch.)

Beech Aircraft Corporation in cooperation with the CAA is working out a **MODIFICATION KIT FOR LICENSING C-45 G AND H SERIES** surplus airplanes now being sold by the military. A rigid inspection procedure has been developed which, according to a Beech spokesman, will go far to protect the reputation of an original Beech product. Licensed gross weight will be in the 8,500 to 8,750-pound bracket.

AMERICAN AIRLINES has sold 10 of its surplus Convair 240 airliners to Francis L. Duncan, who is understood to have resold them in Brazil.

MOONEY AIRCRAFT'S ANNUAL DISTRIBUTOR AND DEALER MEETING will be held in Kerrville, Texas, on December 15, according to Norman Hoffman, vice president in charge of sales. The 1958 Mark 20 will be unveiled with a mass fly-a-way of demonstrators taking place following the sales meeting. Also to be revealed is a higher powered flying prototype of the single-engine model and a mock-up of a light twin in the 200-mph. cruise range.

NEW OFFICERS OF THE NATIONAL AVIATION TRADES ASSOCIATION elected at the 18th annual convention last month in Dallas are: William Lotzer, Milwaukee, President; Richard R. Washburn, Eastern vice president; Larry Hunt, Western vice president; Henry Stuart, vice president for airports; Bud Oliver, treasurer; and Charles Parker, Washington, D. C., re-elected executive vice president and general manager.

Francis L. Hine, Airwork, Inc., of Millville, New Jersey, was elected president of the **AVIATION DIS-**

FLIGHT MAGAZINE

DECEMBER, 1957 VOL. 46, No. 12

THIS MONTH'S COVER shows the latest portrait of the Bell XH-40 utility helicopter for the Army, first helicopter designed for turbine power. It has an 825-hp. Lycoming T-53 engine, grosses about 6,000 lbs., and features low-cost maintenance design. Picture shows new improved stabilizer bar atop rotor. Stability equal to that of fixed-wing aircraft is claimed. Bell has logged over 400 hrs. on the XH-40 and flight tests have confirmed its ability to hover at 6,000 ft., temperature 95 degrees, at full gross weight. Production is expected to be ordered soon.
—(Bell Photo.)

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GEORGE E. HADDAWAY, Editor-Publisher; TOM ASHLEY, Managing Editor; FRED N. STONES, JR., Business Manager; LOUISE ROBERTSON, Circulation; E. H. PICKERING, Consultant; P. O. Box 750 (2700 N. Haskell Ave.), Dallas, Texas — Telephone TAylor 3-6191.

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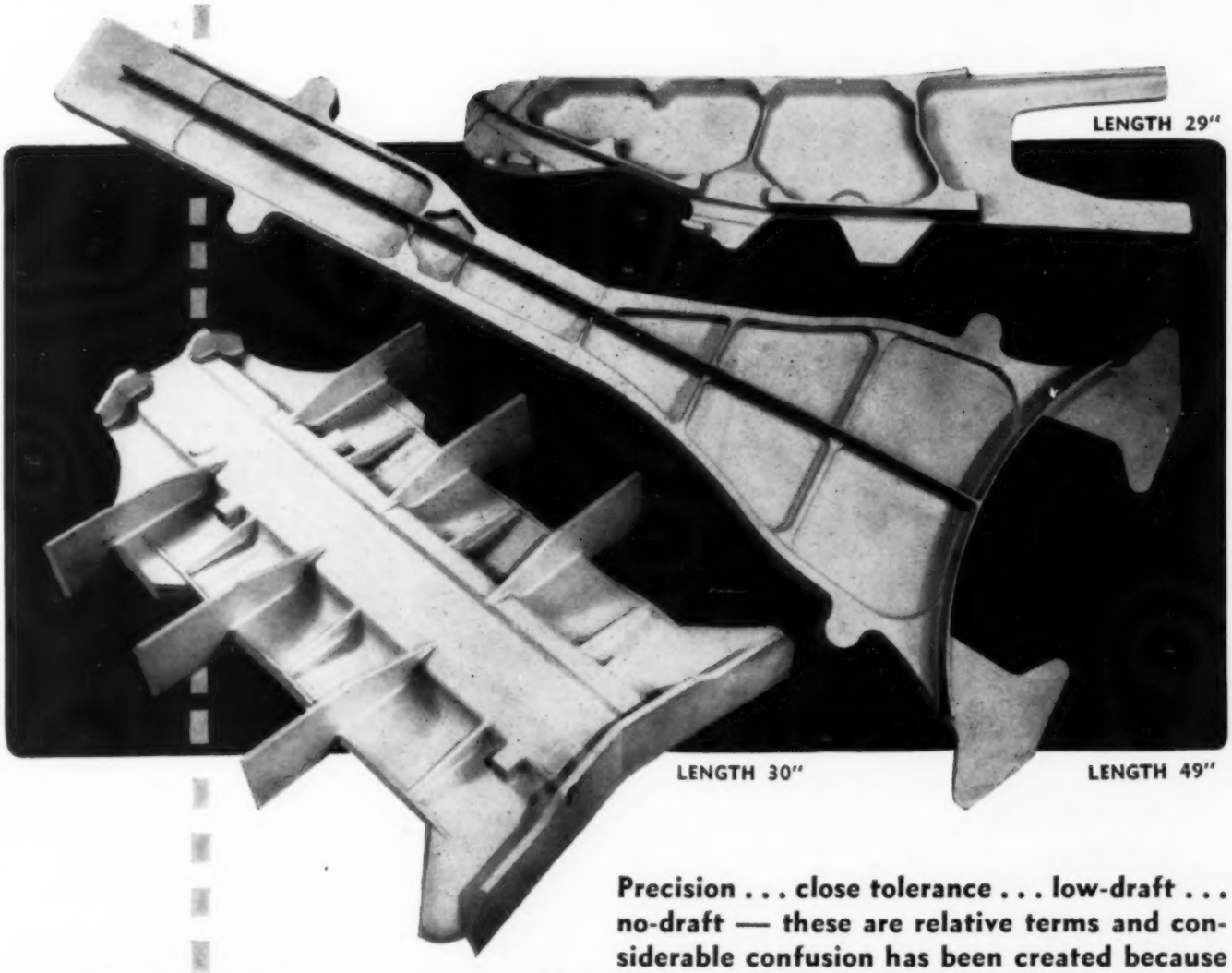
TRIBUTORS AND MANUFACTURERS ASSOCIATION at the annual mid-winter meeting of the organization in Detroit November 22. Dee Hollowell, Continental Motors Corporation, Muskegon, Michigan, was elected manufacturing vice president and Paul Kennedy, Southwest Airmotive, Dallas, was elected distributors vice president.

MORISSEY AIRCRAFT at Orange County Airport, California, now plans to produce 100 units of its tricycle, low-wing Nifty trainer design in its first production batch. Five are in final stages of completion. A sixth, first to fly with a 115-hp. Lycoming engine, is cruising 122 mph. in flight tests. The 1,450-lb. Nifty has tandem seating, trainer handling characteristics and has been quoted at $6,900. It was licensed by CAA with 85-hp. engine and will be licensed for the more powerful Lycoming.

EIGHT PERSONAL PLANE MANUFACTURERS listed domestic sales of 419 utility and business aircraft during October with billings totaling $7,174,000 as compared to 404 shipments valued at $7,086,000 for September, according to Joe Geuting, Jr., manager of the Utility Airplane Council, Aircraft Industries Association. The eight manufacturers have delivered 5,049 planes worth $82,249,000 during the 10-month January-October period. By makes and models, they are as follows: Aero Design—129 Aero Commanders; Beech—430 Bonanzas; 94 Twin-Bonanzas, 99 Super 18's, 7 D18E's, 35 B-45 Mentors and 1 Travel Air; Call Air—28 Model A4; Cessna—688 Model 172's, 36 Model 170B's, 723 Model 182's, 367 Model 180's, 1 Model 195, 82 Model 310's and 35 Model 310B's; Champion—99 Model 7EC and 91

OVERHEAD INTAKE DUCT distinguishes new 1,300-mph. North American F-107 fighter-bomber, which NACA is evaluating. Both vertical and horizontal stabilizers are all-movable and F-107 replaces ailerons with spoilers on top and bottom of wing. It exceeds Mach 2 in both level and climbing flight and is supersonic even in a vertical climb. Engine is 20,000-lb. P & W J-75.
—(North American Aviation Photo.)

PRECISION FORGINGS By WYMAN-GORDON



Precision . . . close tolerance . . . low-draft . . . no-draft — these are relative terms and considerable confusion has been created because they have been loosely used. Close tolerances on large forgings have been pioneered by Wyman-Gordon over the years. The degree of precision which is practical now becomes a question of economics.

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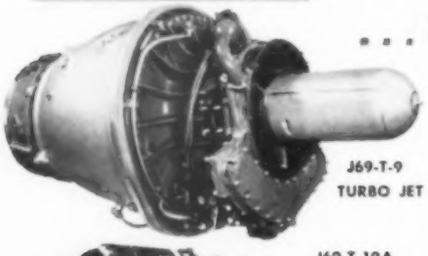
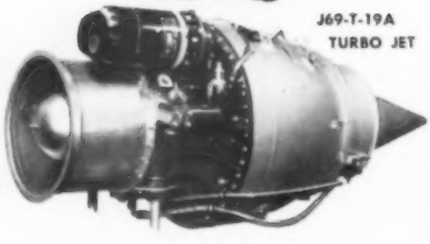
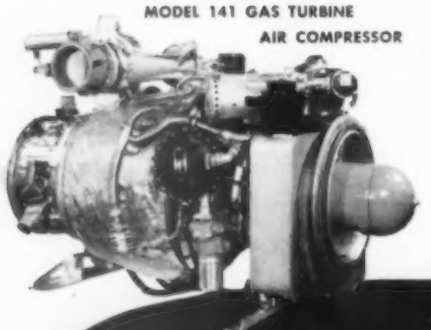

J69-T-9 TURBO JET


J69-T-19A TURBO JET


MODEL 141 GAS TURBINE AIR COMPRESSOR

. . . the T-37 Twin Jet Trainer with C. A. E. Turbine Power

Air Corps flight training routine took a significant step forward recently, when the T-37 twin jet trainer entered its Phase VIII testing at Bainbridge Air Base, Georgia. Twenty hand-picked officers embarked on a course known as PROJECT PALM, with the two-way goal of training for them, and suitability testing for the plane. This new high-performance ship advances the jet phase of fliers' training to an earlier stage in the training schedule, speeding the transition from propeller-driven planes to jets, with gains in both safety and economy. Twin J69-T-9 turbines by C.A.E. provide the power.

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Model 7FC; Helio—26 Couriers; Mooney—90 Mark 20's; Piper—933 Tri-Pacers, 695 Super Cubs and 350 Apaches; and Taylorcraft, 10 Model 20's.

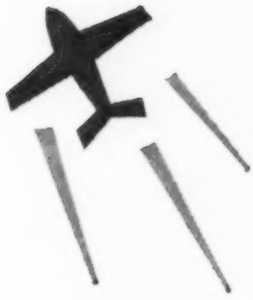
FIRST TWO BEECH TRAVEL AIR DELIVERIES have gone to Combs Aircraft of Denver and Youngstown Airways in Ohio, with the first export Travel Air going to Will L. Smith at Buenos Aires. . . . Beech delivered over $2 million worth of new 1958 models at its annual sales meeting in Wichita and had over $14,800,000 worth of orders for 1958 models before the end of November.

ELABORATELY PREPARED HOW-TO-SELL KITS from the factory are sparkplugging Cessna's intensive drive for over 50% of the industry's business plane sales in 1958. Each kit weighs several pounds and literally leads by the hand the Cessna distributor or dealer salesman using it. Prepared by Sales Promotion Manager Bob Chatley, it is the most detailed aircraft sales material ever used by the industry and provides a liberal education in the fundamentals of merchandising business planes.

CALL FOR PROJECT REQUESTS for the $63,000,000 1959 Federal-aid airport program has gone out from CAA. Local government sponsors must file new project requests not later than Feb. 1, 1958. Highest priority will go to work for fiscal year 1959 construction in the following categories: Developments to remove air traffic bottlenecks or improve air traffic control capabilities; improve-

(Continued on page 14)

PRESIDENTIAL PILOT, Col. W. G. Draper (center), and Lt. Commander Warren C. Mitchell of the Coast Guard (left) flew the new Trecker Super Gull during a recent demonstration of the amphibious twin in Washington and on Chesapeake Bay by H. A. H. Cook Associated, distributors. Civilian is Kenneth Goodsell, Cook pilot.
—(Cook Associated Photo.)



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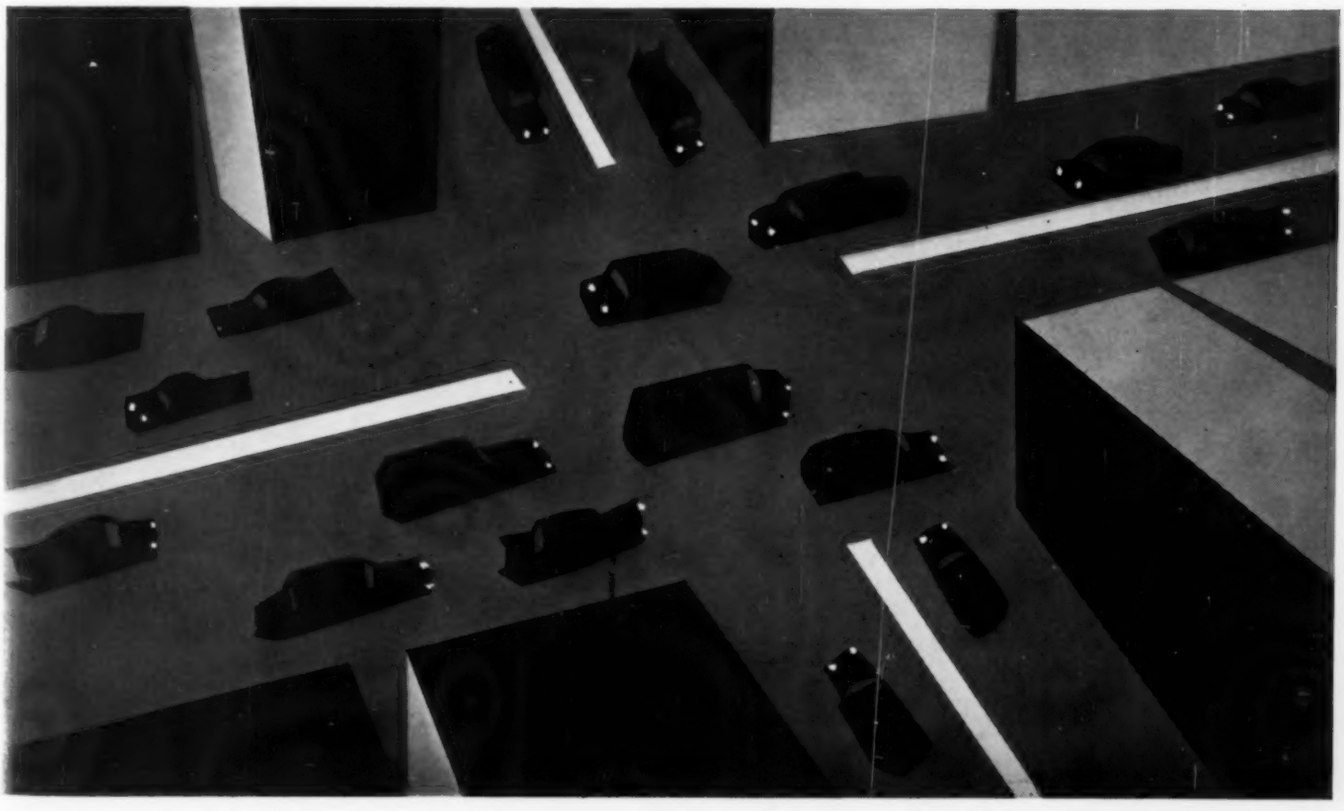

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The MARK 20 is an all-round champion of high performance at low cost. You'll want to see the **new** 1958 Mark 20 at your distributor NOW. See the new and advanced features and prepare to be thrilled by the sparkling fresh styling.

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- **in the desert**
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Because it's the actual "performance" — not "rehearsals" — that stands in the records, the Bell H-13 proudly points to its own . . more flight hours, lower maintenance costs, more dependability.. yesterday, today AND TOMORROW!

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1. Longest approved overhaul period.
2. Interchangeable metal blades.
3. Cyclic boost (power steering) that incorporates latest Bell designed and developed lock and load valves.
4. Synchronized elevator that permits greatest range of cockpit loading without battery or ballast shift.

DERATED ENGINE PROVIDES

1. Improved hot weather and altitude performance.
2. Maximum operating period between overhauls.
3. Reduced maintenance and greater reliability.
4. Reserve power for emergencies.
5. Maximum availability — Minimum cost.

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RESEARCH AND DEVELOPMENT

At Temco GROWTH tells the story

Growth — in expenditures for research and development, for example — tells the Temco success story.

Temco's investment in research and development in the last year increased more than 500% over the substantial sum spent in 1954! This tremendous growth in developmental efforts is part of a long-range program to establish Temco firmly in the electronics and missile weapons system field.

The investment is paying off handsomely. Temco was awarded prime contracts for three of its own missile and aircraft designs last year. Operations research studies continue in other areas, particularly the nuclear field.

Temco's research and development plans continue to expand. This growth is providing experienced engineers an unequalled opportunity in electronics, guidance systems, jet aircraft, missiles and weapons systems.

MR. JOE RUSSELL, Engineering Personnel
Room 107-K, Temco Aircraft Corp., Dallas, Texas

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FIFTEEN YEARS OF HELICOPTER PROGRESS are depicted by the two Sikorsky copters pictured here. Small one is the 185-hp., 2-place R-4, world's first production helicopter. Big Sikorsky is the 4,200-hp., 36-man, twin-engine S-56, now in use by the Army and Marines and holder of speed and altitude-with payload records. Sikorsky R-4 was only helicopter used by the Allies in World War II.

—(Sikorsky Photo.)

AIR REPORT

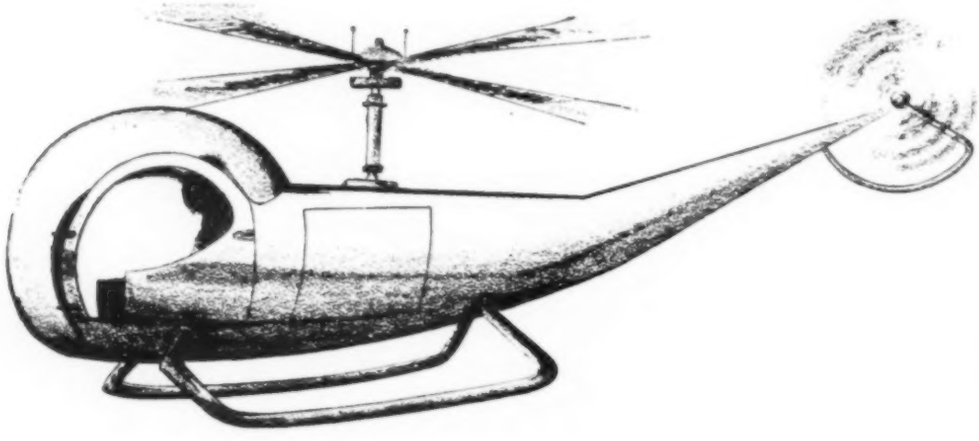
(Continued from page 8)

ments with a "high aeronautical use factor"; improvements necessary for civil jet transports and completion of projects started under earlier programs.

COLLIER TROPHY FOR 1956, aviation's highest award, will go to Chairman Charles J. McCarthy and associates of Chance Vought Aircraft and Vice Admiral James S. Russell and associates of the Navy Bureau of Aeronautics for the development of the F8U Navy Crusader fighter, first operational carrier-based fighter faster than 1,000 mph. Recipients were announced by the National Aeronautic Association, which also announced that Edwin A. Link, inventor of the flight simulator, will receive the Frank G. Brewer Award for the advancement of aviation education.

AVIATION PROGRESS HAS BEEN IMPEDED by U. S. concentration of design and development efforts on large jet engines to the virtual exclusion of small jet engines. Louis W. Davis, assistant to the vice president, engine division, Fairchild Engine and Airplane Corp., made that charge in a talk before the American Society of Mechanical Engineers. Small, lightweight jets of the 1,000-3,000-lb.-thrust type being perfected by Fairchild and others will make possible many new designs of fast, versatile military and commercial aircraft long needed but impractical to produce with large engines. A Fairchild study comparing two aircraft designed for the identical mission, one with a single large 10,000-lb.-thrust jet and the other with multiple lightweight jets, showed the latter to offer 33.6% less gross take-off weight, 26% less airframe weight, 73.4% less total engine weight and 30% fuel savings, with maintenance and operating costs reduced by as much as 50%.

UNITED AIR LINES HAS ORDERED 21 MORE JET AIRLINERS costing $100,000,000, bringing to 51 airplanes costing $275,000,000 the total



HELICOPTERS

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The Army H-23C, built by Hiller, is currently in widespread service.

One of the oldest requirements in military tactics is *mobility*. In today's atomic concepts, that means getting the Army *off the Ground*.
So well proved are advantages of the helicopter for Army use that the only big question now is how to reduce operating costs so that *more* helicopters can be used by *more* units!
The Army H-23D now in production and scheduled for delivery this year represents a major step forward in the goal of attaining lower costs through longer service—1000 hours—between overhauls.

The Army H-23C, ◀ 400 HRS.

The Army H-23D is the first helicopter designed to incorporate the Army's concept of a 1000 hour overhaul cycle on major components. ◀ 1000 HRS.

Engineers: write for opportunities with an industry leader in an ideal California locale.

HILLER HELICOPTERS

PALO ALTO, CALIFORNIA

number of jet airliners UAL has on order. Its latest orders call for 11 new-type intermediate-range Boeing 720's, each grossing 203,000 lbs. and carrying 100 to 125 passengers and capable of operations from any airport now served by DC-7's. The other 10 will be 265,000-lb., 120-150-passenger Douglas DC-8's for long-range service ranging from 1,500-mile hops to California-Hawaii service. The airline had already ordered 30 DC-8's for deliveries beginning in 1959.

SPECIFIC FUEL CONSUMPTION of only .44 lbs. per hp. hr. is claimed for the 180-hp. 4-cylinder Lycoming Model 0-360-A1A engine in the Beech Travel Air.

Beechcraft's Business-Jet Plans

BEECH Aircraft Vice President and General Manager Jack Gaty gave his distributors an interesting briefing on the outlook for pure jet business planes during the company's annual international sales meeting last month in Wichita.

Gaty had just returned from France, where he bought two 4-place, 400-mph. Morane-Saulnier MS-760 twin-jets to be delivered during 1958. Henry Timken, the roller bearing industrialist, gets one of the first deliveries and will be the first American businessman with a licensed straight-jet plane. The price was not nailed down but is expected to be in the $200,000-$250,000 bracket. Beech will keep the other MS-760 for its own demonstrator. These will be the No. 2 and No. 3 MS-760 business planes—No. 1 has been purchased by the King of Persia. CAA certification of the airplane is expected momentarily.

"It will be at least two to four years before any other straight jet business plane can be licensed and placed on the U. S. market," Gaty said. Beech is buying and selling the French-built MS-760 and its French-built Turbomeca Marbore 880-lbs.-thrust jet engines because the planes and the engines are available at less cost than they could be produced for in the United States. Beech also believes small jet engines will have to be perfected further, especially for lower fuel consumption, before small business jets will be practical from the standpoint of satisfactory range. Gaty said no exact prices had been stipulated for current French engines in the MS-760 but he indicated they will csot less than $30,000 each. Turbomeca is now producing two of the engines a day.

The little Marbore jet now has an overhaul period of 300 hrs. and this is expected to reach the 500-hr. mark within six months. Engine overhaul is inexpensive, Gaty said, adding that the jet engine would be practical even if overhauls cost twice as much, owing to the speed advantage in miles traveled between overhauls. He estimated that MS-760 maintenance requirements are now less than one-half a man hour per hour of flying.

Beech sales of the MS-760 for the first year will be handled direct by the factory, although Beech distributors will receive commissions on sales they make for the factory. The Beech factory will support each sale with spare engines, parts, special hand tools, dollies and other requirements. It will also train mechanics for those who buy the jet. Beech is convinced this will be more economical and more practical than the immediate design, production, sales and servicing of a jet of its own. At the same time, it will enable Beech to enter the business jet era and learn the fundamentals involved prior to the time when the factory launches its own jet program. No estimate was made of this timing.

Only four MS-760's will be available from Beech during 1958 after it and Timken receive their jets. The MS-760 has a top speed of about 410 mph. and has a 1,000-mile range at a reduced speed of about 300 mph. The beautiful little French-built 4-place, which has a pressurized cabin and is fully acrobatic, has been demonstrated widely in America by Beech.

Gaty revealed that Beech engineers have conducted extensive design studies for business jet aircraft, rejecting all of them in favor of trying the market first with the MS-760. The firm is now interested in following the development of an 800-hp. turboprop engine in France, its practical application still several years off.

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We are very proud that American Airlines has chosen the Bendix* Ignition Analyzer as the standard equipment for its entire fleet of aircraft. On American's four-engine aircraft the analyzer is permanently installed as airborne equipment. Two-engine aircraft are prepared for portable-airborne analyzer usage.

American Airlines has used the Bendix Ignition Analyzer for quite some time. The decision to prepare the entire fleet of aircraft for use with this analyzer was made after long usage had shown this to be the most suitable equipment for American's requirements.

Major airlines, military services, and corporate aircraft operators have found the Bendix Ignition Analyzer to be a vital and almost indispensable piece of equipment to reduce costs by improving maintenance and operating efficiency. The analyzer plays an important role in reducing en route and turn-around delays, thus improving customer convenience and satisfaction.

The Bendix Ignition Analyzer is a sound investment that will pay for itself within a short period. We would be pleased to provide complete information as to the most convenient and economical analyzer installation for your aircraft.

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SIDNEY, NEW YORK

Bendix
AVIATION CORPORATION

SAC Silver Jubilee Newsreel

BY JACK PATTON

AND NOW THE FUTURE
GET THAT DUST SPECK, ESAU.
NOVEMBER 1957
FRANTIC ACTIVITY AS SAC'S NEW TERMINAL NEARED COMPLETION.
WE CAN'T WEAR THESE OLD CLOTHES IN HERE!
SACSTERS FOUND NEW QUARTERS A FAR CRY FROM OLD HANGAR OFFICES.
CURB SERVICE!
AND A CUSTOMERS' CONFERENCE ROOM, TOO.
CUSTOMERS OOHED AND AHHED AS THE WRAPS CAME OFF.
PEEL ME A GRAPE .... HERMAN.
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DIVISIONS: KANSAS CITY, KANSAS / DENVER, COLORADO

Just among ourselves

Crisis In Education

THE United States Office of Education last month released a report based on a two-year survey of science education in Soviet Russia which shows that Russian high school graduates have had five years of physics, four years of chemistry, a year of astronomy, ten years of mathematics and five years of biology. Less than one-seventh of our U. S. students get any physics at all and not one graduate of American high schools receives the science training in twelve years that every Russian student gets in ten!

The wide dissemination of these shocking facts and figures should startle the American people into immediate action. However, public interest and alarm isn't enough. Since Sputnik, everybody is in favor of an accelerated ballistic missile program. This can be immediate. But the tragic crisis in American education can't be cured by simply turning a crank in Washington. The kind of science training our secondary school students need today would require several years and millions of dollars if it's left up to Washington. What we need is local action.

The U. S. aviation industry can provide the original impetus for local action and set the example for the rest of American industry to follow. Here is the formula:

Last year officials of Temco Aircraft Corporation became alarmed over the paucity of scientifically trained people and took a long look into the reasons why. They learned that there were four public high schools in their area which did not offer physics courses. They learned that the schools not only couldn't find physics teachers — they couldn't even pay for them if they were available. Recognizing their own need for engineers now and in the future, the Temco executives decided to supply teachers from their engineering staff to the schools on a part-time, no-charge basis. At the beginning of the school year four Temco engineers started doubling in brass at the high schools in nearby Cedar Hill, De Soto, Duncanville and Seagoville. The results have been overwhelming.

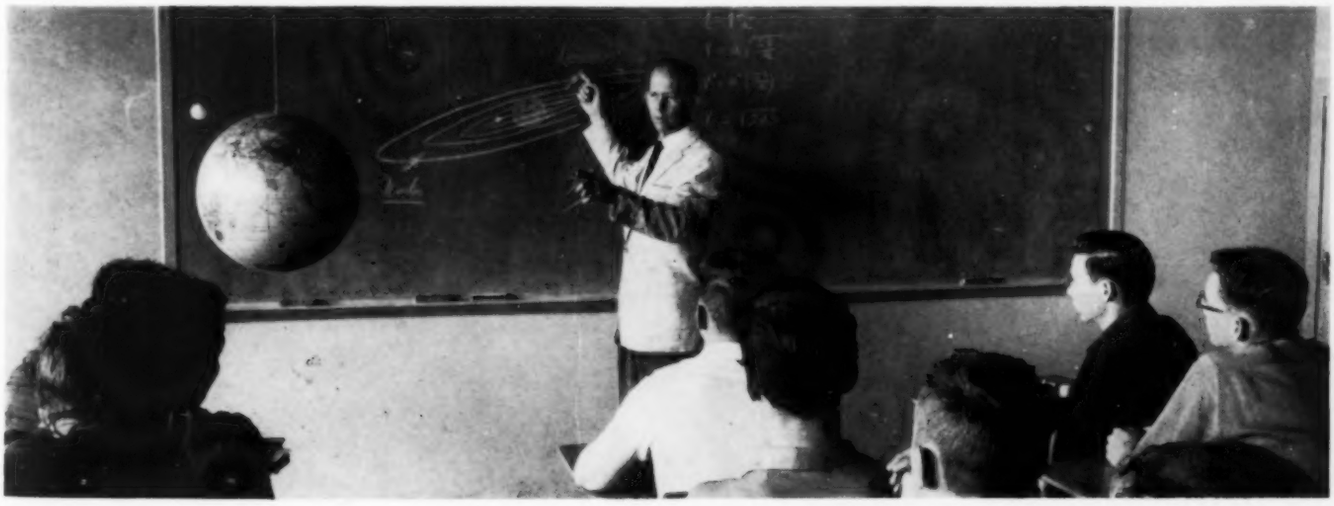
Instead of the eight to ten students per class predicted by the principals of the four schools there are now 88 students taking the courses. In one of the schools only nine students enrolled in the physics class on opening day. By the end of the week the total jumped to nineteen. Since then more than twenty students have applied for physics at the mid-term. Of the eleven seniors in the present class, only two originally planned on college after high school graduation. Now all eleven are planning on college educations. In one school a vocational training class is building physics lab facilities instead of boats and birdhouses. Local industries are being asked to contribute needed items.

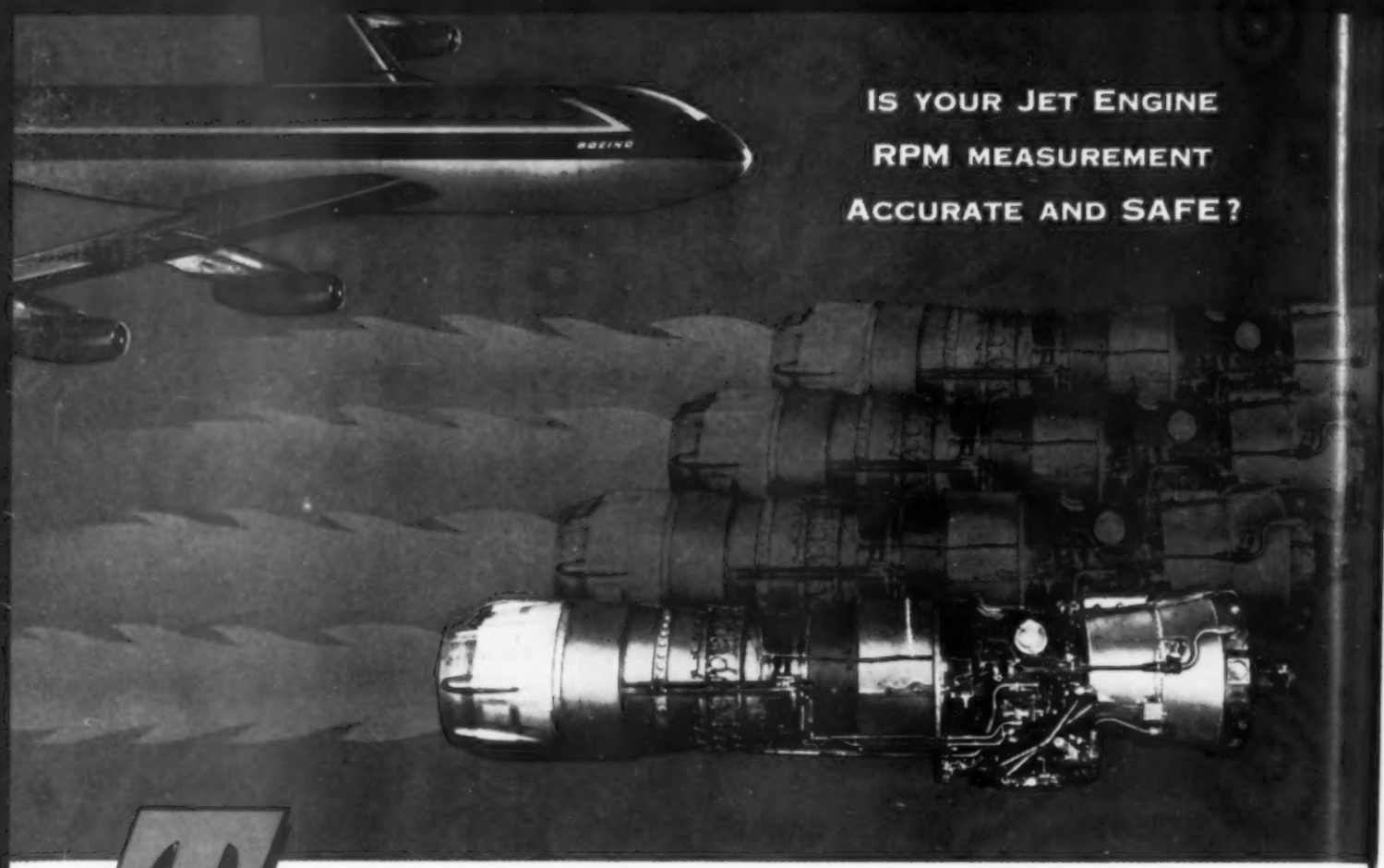
Since Temco's engineers are salaried, the two hours per day, five days per week the men are off the job are negligible as a cost item. The new teachers' practical, up-to-date knowledge of their subject has had a tremendous influence on the students and the Company has found that teaching has proved to be a real stimulating experience for their engineers. It's a natural. Everybody wins. Nobody loses.

Temco officials say the plan should be expanded to include other subjects, especially to beef up mathematics courses and include subjects such as calculus in some high schools.

(Continued on page 72)

Temco nuclear physicist and propulsion engineer, Fred Watts, uses a satellite to demonstrate the principles of centrifugal force and gravity as he doubles in brass teaching physics one hour per day in a Dallas County high school where no physics instruction has ever been available to students. Watts holds two 15 minute "jam sessions" a week in which students discuss matters of current interest related to what they are learning.





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The new B & H TAKCAL incorporates a refinement of the frequency meter principle. It operates in the low (0 to 1000 cps) range, reading the frequency of the tachometer generator on a scale calibrated in percent RPM corresponding to the engine's RPM. It reads engine speed while the engine is running with a guaranteed accuracy of ±0.1% in the range of 0 to 110% RPM. Additionally, the TAKCAL circuit can be used to trouble-shoot and isolate errors in the aircraft tachometer system, with the circuit and tachometer paralleled to obtain simultaneous reading.

The TAKCAL's component parts are identical with those used in the J-Model JETCAL Analyzer. They are here assembled as a separate unit tester and for use with all earlier models of the JETCAL Tester.

The TAKCAL operates accurately in all ambient temperatures from −40°F. to 140°F. Low in cost for an instrument of such extreme accuracy, it is adaptable to application in many other fields.

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CHECKS TACHOMETER "SYSTEM" ACCURACY.
ADAPTS TO ANY FREQUENCY PROBLEM!
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Mobil SOLVES THE TOUGH PROBLEMS OF FLIGHT LUBRICATION...

This Bell Helicopter has been of tremendous value in Magnolia's off-shore operations.

NEWLY DEVELOPED

NEW MOBILGREASE AERO LO-TEMP

For improved performance, added protection and reduced maintenance of grease lubricated parts — including instruments, where protection from corrosion and minimum frictional drag are particularly important — specify Mobilgrease Aero Lo-Temp.

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Mobil Aero Hydraulic Oil HF and HFA — these low pour point and high VI oils help assured trouble-free operation of hydraulic control systems, brakes and struts through all temperature ranges.

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Vice President and Operations Manager Robert Angstadt reports, "We have been very satisfied with the Sapphire 1016."

CHICAGO HELICOPTER AIRWAYS

equips fleet with

NARCO Sapphire 1016 RADIO

Operating scheduled helicopter passenger service between Chicago Midway Airport, O'Hare Field and downtown Chicago with an average of 5.3 landings per hour with each helicopter, the operation of Chicago Helicopter Airways, Inc., is one of the toughest tests imaginable for airborne electronic equipment.

For over a year Chicago Airways' fleet of Sikorsky S-55 helicopters has been operating with Narco Sapphire 1016 VHF communications units with 360-channel transmitter and 560-channel receiver. Satisfactory operation of the Narco 1016 led to selection of the same units for the company's new fleet of 12-passenger Sikorsky S-58's.

"We selected the Sapphire 1016," says Mr. Robert Angstadt, Vice President and Operations Manager for Chicago Helicopter Airways, "after considering factors of form, performance, weight and cost. We found the Narco 1016 offered a great deal of flexibility in communications for the dollars involved. We have been very satisfied with the operation of these units."

Some of the 1016's have flown well over 1,000 hours in the Chicago helicopters, averaging 15 frequency changes per hour—a gruelling test, and proof of the Sapphire 1016's stamina and ability to perform under the toughest possible conditions of vibration and continuous operation.

FOR MAXIMUM NAV/COMM FLEXIBILITY - NARCO Sapphire 1016

TSO'd for scheduled airline use. Provides automatic crystal-controlled operation (SCS or DCS), or independent transmitter and receiver crystal selection, with optional dual control heads. Receiver range covers 108 to 135.95 mc including all NAV frequencies permitting crystal-controlled NAV tuning when VOR/ILS NAV unit, such as Narco VOA-3, is attached.

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Sapphire 1016

90/360-CHANNEL TRANSMITTER
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New Cessna YH-41 "delivers" top performance plus big maintenance savings to helicopter flying!

Cessna's all-new YH-41, now being delivered to the U. S. Army for its air "arm", combines the latest in design and engineering advances to give **operating** and **maintenance** performance never before experienced in the helicopter field!

For example, the engine — mounted in the nose of the fuselage — makes installation and servicing easy — provides extra cargo, or passenger space. Cessna has made the rotor assembly aero-dynamically clean. Also, the drive system on the new YH-41 is a masterpiece of simplicity, has a minimum of parts — conveniently located for easy servicing.

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Offering multi-utility uses, the 4-place, YH-41 at 3,000 lbs. gross weight — can climb higher, faster, than any other helicopter in its class — sea level to 10,000 ft. in less than 12 minutes! Its speed is the fastest in the light helicopter field.

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. . . the 3-way Navigation System for Helicopters

Bendix Decca actually traces on a map in the helicopter cockpit the exact route you are flying. Every movement of the craft is instantly traced on this Flight Log. You **always** can see exactly where you are — in any weather — and you can fly a safe, positive course.

Bendix Decca gives you a 3-way check — (1) for accurate area coverage navigation, (2) for traffic control and (3) as a safe approach and landing system.

This is the **low frequency system** which operates behind buildings, beyond line of sight and below the curvature of the earth.

Decca is the missing link in helicopter navigation.
Write us for the complete story.

DECCA NAVIGATOR SYSTEM

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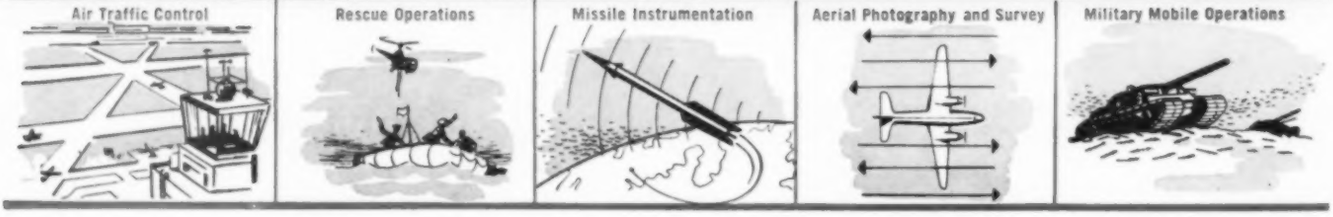
PACIFIC DIVISION
Bendix Aviation Corporation
NORTH HOLLYWOOD, CALIF.

BENDIX-DECCA SOLVES THE PROBLEMS OF . . .



After 30,000 hours and 2,000,000 miles, here's what PETROLEUM HELICOPTERS says about Franklin engines:

Mr. C. L. Tysdal, our superintendent of maintenance, says he considers the Franklin one of the best light engines ever made.

Stan Clay, chief pilot of Petroleum Helicopters, has over 2,000 pilot hours in Bell helicopters powered by Franklin and says it is one of the most dependable engines he has encountered in his experience.

Our type of operation really gives an engine a workout, but it is a rare occurrence when a Franklin doesn't go the full 600 hours for a major overhaul.

The above are excerpts from a letter from Leon Boyd of Petroleum Helicopters, Inc.

Franklin

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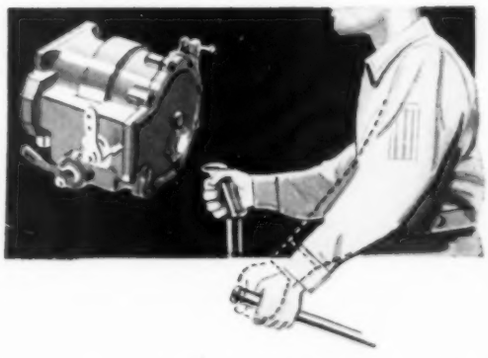
The CURTISS-WRIGHT Automatic THROTTLE CONTROL

gives helicopter pilots a "Third Hand"



Many times a helicopter pilot wishes he had three hands . . . one to govern direction, another to control the up, down or hover movement, and a third to regulate the throttle. Now, Curtiss-Wright, in cooperation with the U. S. Army and the U. S. Navy, answers this need for a "third hand" with the all-mechanical Automatic Throttle Control.

It makes the pilot's job much easier. He simply sets the desired engine speed with the regular twist-grip throttle . . . the Automatic Throttle Control takes over and keeps engine speed constant, automatically adjusting fuel flow to meet changing conditions.

The Automatic Throttle Control adds immeasurably to the safety and utility of helicopters . . . safeguards engine against overspeed. Planned for use in airships and other throttle-governing applications, it is one more example of the many cooperative contributions by Curtiss-Wright to America's leadership in air transportation.

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All-weather flight for Helicopters

Sperry Announces Advanced Developments in Controls

To increase the all-weather capability of helicopter flight has been a continuous research and development program at Sperry. The newest development is a Stabilizing Control System adaptable to all types of rotary wing aircraft.

This new miniaturized electronic system is designed for partial or fully automatic control to achieve stability during take-off, in flight, hovering and landing – in varying conditions of wind and weather. Use of transistors, redundant amplification and rugged miniaturized components, engineered with traditional Sperry precision, give the new system great accuracy and reliability—all within small space and light weight for either the minimum or fully automatic system.

CHIEF BENEFITS OF THE NEW SYSTEM ARE:

Reduction of pilot fatigue. Constant stick handling is eliminated.

Accurate navigation. Precise flight is achieved even under conditions of poor visibility and over unfamiliar terrain.

All-weather flight. Automatic system provides hands-off stability needed under all flight conditions.

Control stick steering. The pilot generates command signals by moving stick in conventional manner.

Other Sperry developments for helicopters include a new Sperry All-Weather Integrated Instrument System. Providing simplified display of all data for manual control, it includes Flight Director Computer, Horizon Flight Director Indicator, Navigation Computer, Compass Pictorial Displacement Indicator, Altitude Vertical Rate Indicator and RPM Control System (also available individually). If you have a requirement in helicopter controls and instrumentation, write our Aeronautical Equipment Division.

AERONAUTICAL EQUIPMENT DIVISION

SPERRY GYROSCOPE COMPANY
Great Neck, New York

DIVISION OF SPERRY RAND CORPORATION

BROOKLYN • CLEVELAND • NEW ORLEANS • LOS ANGELES
SAN FRANCISCO • SEATTLE. IN CANADA: SPERRY GYROSCOPE COMPANY OF CANADA, LIMITED, MONTREAL, QUEBEC.

Commercial Bell Model 47 production is seen at left. Above is newest XH-40 portrait with stabilizer bar atop rotor. Six-place H-40 grosses about 6,000 lbs. and has 825-hp. Lycoming T53 turbine.

More Emphasis on Commercial Copters

WITH commercial helicopter activities continuing their growth, the U. S. helicopter manufacturing industry is still largely dependent on military programs for developmental progress and 1957 has been largely a year of "wait and see."

Turbine installations promising great advantages domiaated developments during the year. These, however, are primarily experiments devoted to the replacement of piston power with turbine power, the chief gains being more payload for short flights, simplified power plant installation and reduced maintenance. Only one project involved a helicopter actually designed for turbine power — the Bell XH-40, which remained in the "Y" stage of development through the year although it is advanced far enough for a full production effort. A second design for turbines was instituted near the end of the year — the Kaman HU2K-1, a utility machine resembling the Bell 40.

No turbine transport program for multi-engine advantages was under way during the year. The replacement of single piston engines with dual turbines in a Sikorsky S-58 and a Vertol H-21 took on added significance but these projects are not primarily intended for multi-engine transport development in the sense of acquiring engine-out performance advantages. What the operating industry — especially the scheduled helicopter airlines in Los Angeles, Chicago and New York — needs is a multi-engine transport capable of continuing flight with one of its engines inoperative. The helicopter airlines are likely to be operating single-engine machines for several more years and the outlook for progress here is discouraging because of lack of military development programming. No single helicopter airline or helicopter manufacturer, for that matter, can yet afford to underwrite this development as a private venture.

One-man copters, flying platforms, convertiplanes and giant flying-crane helicopters are proceeding as developmental items but only on a meagre scale, with no real hope or promise of significant production soon. The military production outlook is for concentration on a few types already being produced or in the final stages of field-test development. This has caused the so-called "big three" of Sikorsky, Bell and Vertol to intensify their commercial sales programs.

Bell Helicopter Corp. has the most ambitious commercial sales program, implementing greatly-expanded marketing during the year. First step was establishment of a sales force under Fred L. Roscoe, until recently a leader in Cessna Aircraft's successful fixed-wing marketing activity. Bell sells direct from the factory. Roscoe has placed regional sales representatives in the field to beat the bushes vigorously with new demonstrators and well-organized sales efforts.

Harvey Gaylord, Bell president, says the program is already showing impressive results and promises an increase of about 30% in sales for 1958. The 1957 gain over 1956 was about 30%, Bell's commercial gross volume being about $10,000,000 for 1957. The firm's commercial helicopter sales have set a new record each year for the last six years. Gaylord said more than one-third of his 1957 commercial sales went to 36 new operators and business establishments. Sales to new users are most difficult of all. "This indicates we are making progress toward our eventual goal of $25 million for commercial sales annually," Gaylord commented. Sales show a strong trend for business and industry use of helicopters for executive and interplant travel, for airport-to-city transportation and for suburban commuting. Meanwhile, there is also growth in sales for offshore oil operations, forestry work, commercial fishing, exploration, agricultural and ranch flying, construction, air taxi, topographic surveys and advertising and sales promotion.

Topping the many new executive users of Bell helicopters in 1957 was

Current Production Commercial Helicopters

Factory Data as of December 1, 1957

Make and Model	No. Places	Hp.	Gr. Wt. Lbs.	Useful Ld. Lbs.	Fuel Gals.	Cr. Spd. Mph.	Price
Bell 47G	3	200	2,350	915	43	81	$ 33,000
Bell 47G-2	3	200*	2,450	886	43	89	39,500
Bell 47H-1	3	200	2,350	850	35	92	39,950
Bell 47J	4	240*	2,800	1,185	35	99	68,500
Doman LZ-5	8	400	5,200	1,950	117	80	120,000
Hiller 12C	3	200	2,500	858	28	76	47,750
Sikorsky S-55	12	600	7,500	2,312	185	91	151,000
Sikorsky S-58	14	1,525	12,700	5,140	198	101	253,000
Vertol 44A	19	1,425	14,000	5,345	300	101	279,800

NOTES: All Bell prices are domestic only. *Derated Lycoming. Fifteen-place Vertol 44B airline version is priced at $294,800.

President Eisenhower, for whom the Air Force acquired two Model 47J 4-place Bells. Other 1957 deliveries of Bells went to Arthur Vining Davis, Alcoa board chairman; James E. Hall, Idaho logging firm owner; Continental Oil; Northrop Aircraft; Roger Sherman Transfer of Hartford, Conn.; Frouge Construction of Bridgeport, Conn.; Burlington Mills of Greensboro, N. C.; Blakely Oil of Phoenix; Waggoner Ranch of Vernon, Texas; Radio Materials Corp. of Chicago;

Newest Vertol project is Model 105 *(right) conversion of H-*21 *with two Lycoming T*53 *turbines. Commercial Vertol* 44 *scenes below show demonstrators as flying crane, transport at midcity Houston heliport and as* 15*-passenger airline and* 10*-passenger executive transport. Model* 44 *has* 1,425*-hp. Wright,* 5,345*-lb. useful load at* 14,000*-lb. gross and* 88*-knot cruising speed.*

OILMEN WITH COPTERS can drill anywhere in the world without surface transportation, as proved by these photos of World-Wide Helicopters' three Sikorsky S-58's transporting equipment into the virgin wilds of New Guinea. A special "heli-rig" was flown in by components, the largest being 4,000 lbs. For example, 41 trips were made to fly in a 131-ft. jacknife mast and its 10-ft. substructure. Two-ton bulldozers flown in prepared the site. Dense jungle limited the site to a small area. From March until August, 1957, the Sikorskys made nearly 2,000 flights to move 6,385,128 lbs. of supplies and equipment. In that time, two drill rigs, at different locations, were put into operation and maintained by the choppers. Highest load the S-58 can carry is 4,000 lbs. In America, Sikorsky S-55's and S-58's are heavily used by the oil industry in the Gulf of Mexico, transporting an average of more than 20,000 workmen a month to and from offshore rigs.

—(Sikorsky Aircraft Photos.)

Aeroflex Corp. of New York and others.

In addition to the 4-place Model 47J Ranger, powered by a 260-hp. Lycoming engine, Bell is producing the 3-place 47G and 47H, powered by 200-hp. Franklin engine, and the 3-place 47G-2, with 240-hp. Lycoming power. Approximately 2,000 Bell helicopters have been manufactured and their operations around the world have logged over 2,500,000 hrs. in the air.

T53 Powers Vertol 105

Twin-turbine power for Vertol's H-21 transport helicopters moved closer by the end of 1957, as Vertol Aircraft Corporation announced a diversified turbine program for its large "Workhorse" helicopters.

Under a contract with the U. S. Army and Navy Bureau of Aeronautics, Vertol began a flight test program on the twin-turbine-powered H-21D early in the fall. This aircraft has two General Electric T58 turboshaft engines installed in a standard production Army H-21C. Extensive ground tests were conducted prior to first flight, which took place late in September.

In a company-sponsored program, the helicopter manufacturer has put

two Lycoming T53 turboshaft engines into one of its own H-21 helicopters, designating the project aircraft the Vertol Model 105. This aircraft was first flown on November 20. The engine installation and associated gear box for the Model 105 have been designed to be installed easily as a retrofit package. Vertol engineers have a similar "package" designed to incorporate the GE T58 turbines.

These will be offered the military services for installation in current in-service aircraft or new production aircraft. A similar retrofit package will be available also for commercial users of the Vertol Model 44, a certified version of the military H-21 helicopter.

Installation of these twin turbine power plants, in place of the present single piston engine now in use, will give the helicopter advantages in multi-engine reliability, higher payload, increased speed, as well as advance the helicopter's all-weather flying capabilities. Vibration will be considerably reduced.

Payload of the turbine-powered H-21 will be increased by 40% over the present version and cruising speeds will increase up to 50 miles per hour, Vertol says.

For the H-21 operators, this increase in cruise speed and payload will more than double the ton miles per hour capability of the Work Horse, according to Vertol. This means a lower cost per ton mile to operate.

In short hauls, rescue work, or in any operation where a large part of the helicopter's time is spent in power-demanding take-off and hovering, the fuel consumption advantages of the gas turbine engine at maximum power scores over the piston engine. These factors, when combined with the lower cost and greater safety of the turbine engine fuel, offsets the higher fuel consumption of the turbine.

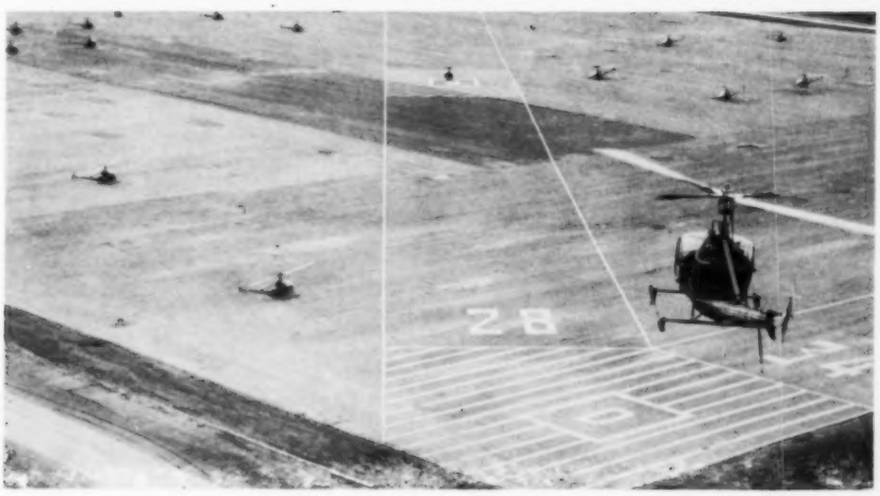
Maintenance-wise, the compactness of the turbine retrofit package makes

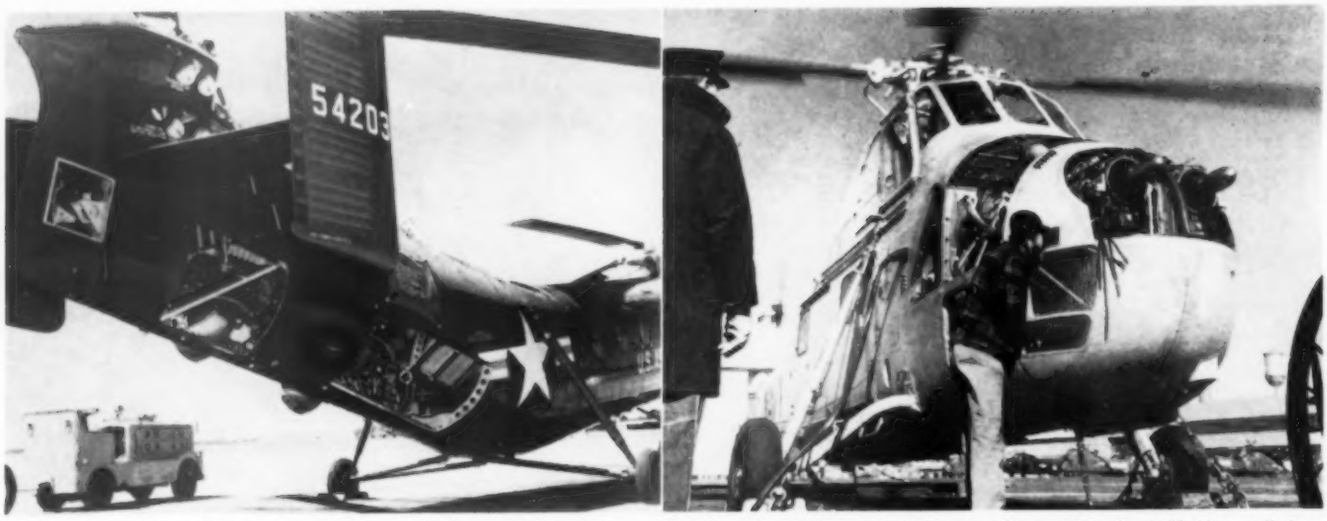
(Continued on page 74)

CESSNA YH-41 is now being delivered to the Army at a rate of two per month, with a work force of 75 employes of whom 40 are on the production line. YH-41 has 270-hp. (net to transmission) supercharged Continental FSO-526A engine, 950-lb. useful load at 3,000-lb. gross weight, 100-124-mph. cruise speed, 1,350-fpm. rate of climb, 14,500-ft. hovering ceiling at 2,600-lb. gross, 290-mile range on 60 gals. of fuel and 3.8-hr. endurance.

(Cessna Photo.)

HILLER HELICOPTERS include commercial 3-place Model 12C with supercharged 200 hp. Franklin engine (right), military H-23C trainer (below, right, at Army's primary copter school, Camp Wolters, Texas), and one-man XROE-1 Rotorcycle (below). Latter has 257-lb. useful load at 526-lb gross weight, 40-hp. 4-cylinder two-cycle Nelson H-59 engine, 52-mph. cruise speed, 1,160-fpm. rate of climb and 166-mi. range on 16 gals. of fuel. Latest Hiller 3-place copter is Army's H-23D with 250-hp. Lycoming, 920-lb. useful load at 2,700-lb. gross weight, 1,250-fpm. rate of climb, 13,200-ft. service ceiling, and 186-mi. range on 48 gals. of fuel.





Flight tests have been conducted with Vertol H-21 (left) and Sikorsky S-58 (right) modified with installation of two T58 turbines in each. The turbines replaced a single 1,525-hp. piston engine in the two helicopters, giving them a total of up to 2,048 hp. each with T58's.

General Electric T58 Development

By Small Aircraft Engine Department Staff
General Electric Company

THREE and a half years after the launching of General Electric's T58 aircraft gas turbine project, a proven engine is emerging which next year will be on the production line at GE in Lynn, Mass. On October 29 of this year, the T58 was officially accepted by the military services with the announcement that the engine had successfully completed the official 150-hour Model Test.

Already the engine is being proven in flight; in tests it has more than fulfilled performance specifications. Some applications of the engine have been announced and others will be forthcoming. The investment by the U. S. Navy and General Electric is now culminating in an engine that is helping to launch the era of gas turbine-powered helicopters. One could say that the progress made by the T58 is a repetition of all successful engine projects, particularly so far as aircraft gas turbines are concerned.

But there are new aspects to the T58 never before associated with any other aircraft gas turbine.

Guaranteed Performance and Specifications

For instance, it is entirely plausible that the T58 may be produced and used for the next twenty years. This, admittedly, is a revolutionary life expectancy for this type of engine. The probability of this actually occurring is based on characteristics of the engine itself. On the production model, the guaranteed performance and specifications are:

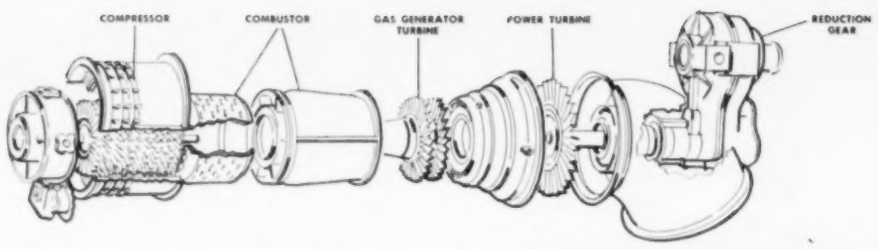
1. Power of 1,050 hp. with a weight of only 267 pounds — a horsepower-to-weight ratio that has not been excelled in any other small aircraft gas turbine. Even if future engines are developed that exceed this ratio, the T58 will remain a highly efficient and practical engine that would continue to attract users.

2. A specific fuel consumption of 0.64 lbs. per hp. hour — a figure that compares favorably with the SFC of today's reciprocating engines. Economically, the rate of fuel consumption of the T58 makes it practical not only for helicopters and other aircraft, but also for ground applications.

3. Its dimensions of 55 in. length and 16 in. diameter. This small size makes it feasible for the T58 to be used in many vehicles where space is severely limited.

While the T58 has been designed for use initially as a helicopter powerplant, it can be used for various other aviation applications: convertiplanes, transports, and several radically new types of aircraft. In addition to its role in the era of gas turbine-powered helicopters, and other aircraft the T58 may also help launch the era of gas turbine-powered boats, such as the hydro-foil boat and landing craft, ground power equipment, and oil well equipment. Its light weight, high power-to-weight ratio, economical maintenance, and portability make the T58 an extremely versatile powerplant for non-aviation applications. Future application possibilities for the T58 are substantial in number, com-

Here's a mock-up of the new Kaman HU2K-1 utility helicopter for the Navy designed for T58 turbine power.



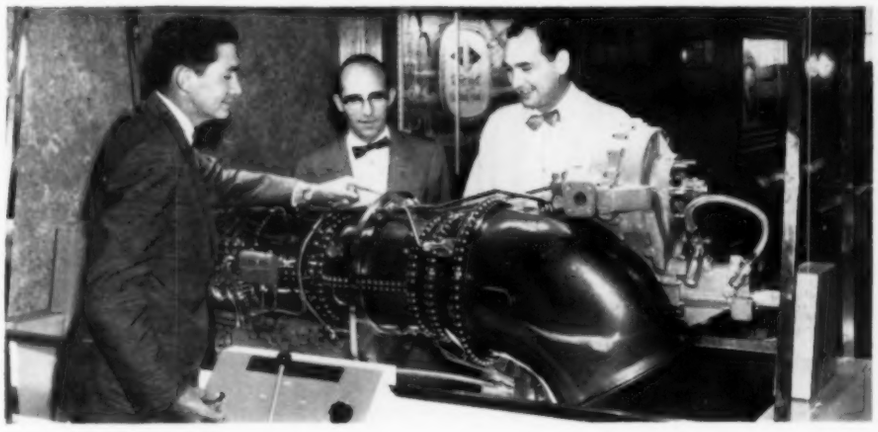


Diagram shows components of the axial-flow T58 and photos show its small size. With a 16-in. diameter, it packs more than 1,000 hp. into a 59-in. frame. Large photo shows rear of engine. Photo above shows T58 from front, with no reduction gear at rear.

mercially promising and interesting technically. The takeoff point is, of course, where the T58 stands today.

Facilities of the Small Aircraft Engine Department are already being planned and prepared for production.

T58's Now Flying

Two aircraft companies are now testing the T58 in their helicopters, and a third company has announced it is designing a helicopter to be powered by the T58 engine.

At the Sikorsky plant in Bridgeport, Conn., the T58 is undergoing flight testing in a modified S-58 helicopter. The first hovering flight in this aircraft occurred in January of this year. Since that time, numerous other test flights have been made. In the testing, control stability, power splitting, installation cooling problems and helicopter gearing and rotor characteristics have been investigated.

The S-58 is the first twin-engine helicopter in this country to be flown with power furnished by two modern aircraft gas turbines. This is significant because it is technically a difficult feat to maintain a balance of power with two engines through the range of power and RPM settings. Flight tests to date have indicated that the T58 control can satisfactorily maintain this balance.

A 22-place Army H-21D helicopter powered by two T58 engines is currently being flight tested by Vertol Aircraft Corporation. These flights are being conducted at Philadelphia International Airport.

In both the S-58 and H-21D, the T58 engines are replacing reciprocating engines.

According to Vertol, payload of the T58-powered H-21 will be increased by 40 per cent over the piston engine version of the helicopter, and the turbine power plants will make possible cruising speeds of up to approximately 150 miles per hour — or 50 miles per hour faster that the current aircraft. It was also stated this increase in cruise speed and payload will more than double the ton-miles per hour capability of the H-21, and then hovering ceiling will be increased by several thousand feet.

Similar advantages are expected to result from the application of the T58 in the S-58 and other aircraft where the gas turbine is used as a replacement for a reciprocating engine. The T58 has also significant advantages compared to other small aircraft gas turbines, such as high power-to-weight, low SFC and maximum installation versatility.

Early this year, Kaman Aircraft Corporation announced the receipt of a contract from the Navy's Bureau of Aeronautics for the HU2K-1, a single-engine utility helicopter that will be powered by the T58. Though it is too early to predict actual performance accurately, it is probable this aircraft will demonstrate even more the advantages accruing from the use of T58 power, for the HU2K-1 is being designed originally for a gas turbine engine.

The T58, since its debut, has become a standout performer. The T58's ruggedness has been proven; guaranteed performance figures have been exceeded in actual operating tests; and its versatility has been improved through design alterations.

Tests Prove Ruggedness

Throughout the entire test program, the T58's ruggedness has been proved repeatedly and conclusively by the fact that there have been:

1. No catastrophic failures
2. No compressor or turbine bursts
3. No broken turbine buckets or broken compressor blades that were not contained in the engine casing.

To cite actual cases, in one test in which the engine was being run without overspeed governors and with a water brake, the water brake failed. The speed of the power turbine went from 19,000 rpm. to over 30,000 rpm. in one second, or more than 10,000 rpm. above 100% speed. The engine merely coasted down, and the test was continued for an additional two minutes to check strain gauge stresses on the turbine buckets.

In another test run, a special development instrumentation hole over the oil sump near the power turbine was not sealed prior to starting the test. With the oil supply thus exposed to the hot gases, an explosion and fire occurred at normal rated power. The explosion severed the attachment structure of the engine mounting pads, dropping and slamming the engine against the mounting frame. When disassembled, the damage was found to be localized and self-contained in the power turbine. The gas generator portion of the engine, including compressor and turbines, was undamaged and back on test in less than a week.

The T58 prototype engine, unlike

the production model, includes a main reduction gear and weighs 325 pounds. The performance guarantees for this configuration are 1,024 military shaft horsepower and 0.66 military SFC. As previously stated, the production model engine guarantees differ as a result of the main reduction gear being an optional item. These guarantees are 1,050 military shaft horsepower and 0.64 military SFC at a weight of 267 pounds.

The optional main reduction gear on the production model is one of the design improvements that has been made to give the engine the widest possible versatility. Other added features to be incorporated in the production model will include a three-position exhaust, fore or aft power take-off provisions, over-speed governor and torque sensor, and the ability to operate on JP4 and JP5 fuels.

Prototype engines delivered to Sikorsky and Vertol have exceeded or bettered the performance guarantees of shaft horsepower and specific fuel consumption. The best shipment engine delivered 1,114 military shaft horsepower and 0.64 military SFC. The high performance of this one engine has not been an isolated incident but, rather, is substantiated by the average ratings for all engines which have been tabulated as 1,067 shaft horsepower and 0.659 SFC. For the last three shipment engines, the average is 1,086 SHP and 0.649 SFC.

These performance data are based on specific operating regimes, and are not results of high temperature operations. Fuel consumption is quoted as specific fuel consumption on the basis of shaft horsepower only but, as a matter of interest, the calculated equivalent specific fuel consumption would be an even more favorable 0.609 for the best rating of 0.64 SFC.

All the features, improvements and high performance grew out of a sound basic design. Common to the majority of efficient gas turbine engines, the T58 has an axial-flow arrangement of engine components. To provide the good fuel economy, it has an axial-flow compressor with moderately high pressure ratio. For achieving longer life, reducing the engine's sensitivity to hot starts or other thermal abuse, and to minimize the need for strategic materials, the T58 has moderate inlet temperatures. The T58's free power turbine provides a wide latitude of rotor speeds for a given power setting and, conversely, a wide range of power settings for a given rotor speed.

Combustion liner of the T58 has survived rugged 150-hr. test without deterioration. Note small dimensions of the component. Straight-through, full-annular combustor has sixteen fuel nozzles. This combustor generates 13,000,000 BTU's per hour.

Designed For Maintenance

To simplify the maintenance, inspection and overhaul process, the T58 was specifically engineered to provide the following:

1. Major assemblies that can be assembled or separated in the horizontal or vertical position. Major subassemblies that can be interchanged with a minimum of special tools.

2. Light weight and small size to permit easy handling.

3. Most compressor blades removable by stages without disassembly of the rotor, without machining.

4. Readily removable compressor stator vanes and inlet guide vanes without destructive disassembly or machining.

5. Easy inspection of combustion liner and fuel nozzles with split combustion casing.

6. Easily accessible fuel manifold.

7. Easily accessible ignition assemblies.

8. Individually removable turbine nozzle stages.

9. Turbine buckets removable in pairs without machining or rebalancing.

10. Individual removal of turbine wheels by stages without rebalancing of rotor assembly.

5,500 Hours of Testing

The T58 is being subjected to an extensive testing program. This program is not yet complete, but more than 5,500 hours of testing have already been accumulated.

Besides the conventional testing methods, a rotor test stand was erected which simulates the actual installation in a helicopter and allows single or dual testing of engines with something other than a water brake, dynamometer or club propeller. It is equipped with a Sikorsky HSS-1 rotor and transmission system. This testing has been particularly valuable in perfecting the engine and control system response to a helicopter rotor. Data has been secured on the spring constants of the helicopter rotor system and a free power turbine. This data made possible further refinement of computer studies on the engine's integrated power control — an automatic constant speed control. Further testing will seek to define the operational characteristics of other helicopter rotor systems.

In tests simulating a change in flight regime, which consequently imposed a large load on the engine, the T58 control not only responded quickly and accurately, but also bettered design objectives. The power-splitting ability of the T58 has also been confirmed by the rotor test stand. It marks the first time since the advent of small gas turbines for helicopters that twin-engine operation has been attempted successfully.

Future military and commercial requirements are for larger and more powerful helicopters requiring multi-engine installation. The T58's twin-engine operating experience on the rotor test stand, in the S-58 and the Vertol H-21 will provide the industry with a thoroughly-proven engine for

General Electric T58

Factory Data

	With Reduction Gear	Without Gear
Weight, lbs.	325	250
Specific Wt., lbs.-hp.	0.32	0.24
Over-all Length, ins.	59	55
Diameter (max. flange), ins.	16	16

PERFORMANCE

	Shaft Horsepower	Spec. Fuel Consumption lbs.-hp.-hr.
Military Rating	1,024	0.66
Normal Continuous	875	0.69

NOTE: Power turbine speed, 19,500 rpm.
Data for prototype engines. These figures have been bettered by test engines.

future multi-engine helicopters.

Although flight test programs conducted by helicopter manufacturers are important to the development of the T58, they are necessarily directed at the development of the basic helicopter machinery and associated airframe systems. To accomplish full development of the engine and controls in particular, a special flight test program will be undertaken at the GE Flight Test Center in Schenectady, N. Y.

In addition, the T58's anti-icing capabilities have been investigated at the Air Force cold weather site atop Mount Washington. Here the T58 demonstrated its ability to start in sub-zero temperatures and operate under severe icing conditions. More strenuous climatic and altitude tests will begin shortly at the Navy's Aeronautical Engineering Laboratory in Philadelphia.

Cost Reduction Programmed

While every effort has been made to achieve flexibility and efficiency in the T58, it was early realized that the manufacture of this engine would present many challenges, not the least of which was cost. A full scale cost improvement program is being carried on, and significant reductions have already been achieved.

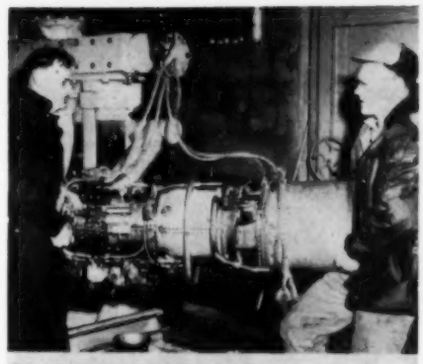
For example, through a thorough analysis of methods used in manufacturing and inspection of compressor blades for prototype T58 engines, inefficiencies were spotted and improved methods introduced that are calculated to save almost 50 per cent of development blade manufacturing time. This achievement is a result of no single major improvement but the sum total of numerous small improvements.

For example, by adding cutters to a milling machine, two cutting operations were combined into one operation. A simple cutting off of slugs to lengths of blades automatically eliminated a separate cutting operation which had been accepted in the past as a standard method.

The search for cost reduction is not being confined to the prototype engines that are being produced currently; it has also included a look into the future when the engine will be mass-produced. New machines are being designed and new techniques are being developed that will provide quality parts at a lower cost. Automation is being applied wherever feasible.

For example, a numerically-controlled automatic punch press has been designed that will result in substantial reduction of direct labor and initial tooling costs associated with manufacturing T58 combustion liners. A way has been found to fabricate compressor casings instead of the former casting method. This is expected to reduce manufacturing time on this item as much as 30 per cent. Plastic tools are being designed that are not only cheaper but also more efficient. A new process of blade mass production has been devised by department manufacturing engineers. By using this process, blades and vanes are now being produced with a high degree of accuracy and finish at very low cost.

Briefly this has summarized the T58 program as it is today. The official 50-hour Model Test on the T58 was successfully passed in August of last year. And slightly more than a year later, it has officially completed the 150-hour Model Test. As a product, the T58 is now ready to become a useful new public servant of the air age.



Ice ingestion and sub-zero temperature operation tests on T58 have been conducted 6,000 ft. atop Mt. Washington (above). Part of Sikorsky installation is shown below. T58 had over 5,500 hours of testing.

An 825-shp. Lycoming T53 powers the Bell H-40, first helicopter ever designed for turbine power. Note small size of turbine compartment atop fuselage. T53 field trials have already earned praise for the turbine's workhorse ruggedness.

Lycoming T53 Program

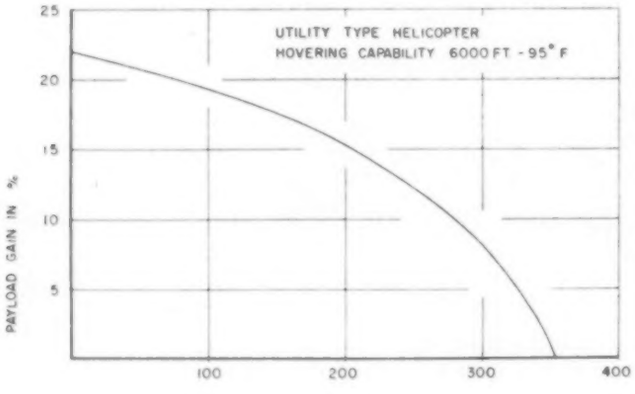
THE history of the helicopter is the history of the helicopter engine; for traditionally, advances in the airframe have been made possible by power plant progress. It is with this background that helicopter manufacturers today are taking a long, hard look at the new gas turbine engine in planning the copter of the future.

First in the field of turbine power for copters has been Lycoming Division, Avco Manufacturing Corporation, which has produced in the T53 the first gas turbine engine specifically designed for helicopter use.

Fifty-year-old Lycoming already manufactures engines for more helicopter models than any other plant in the world. But the Lycoming gas turbine program began just six years ago when Dr. Anselm Franz, who developed and put into production the world's first mass produced jet engine, was appointed to spearhead development of a line of small turbines.

With a staff of six men Dr. Franz sought and received Air Force and Army backing for his engine design. There are now 1,500 persons in the Lycoming gas turbine department in the Stratford, Conn., plant.

The first achievement of the Lycoming group was the T53. It is of the free power design, eliminating any mechanical link between the turbine which operates the compressor and the turbine which operates the power output shaft. The compressor is of a subsonic axial-flow design for the first five stages. To avoid the delicate, high-cost latter stages of a completely axial machine, the final compressor stage is a rugged centrifugal impeller.



Gain in payload is shown in this chart for a turbine-powered copter as compared to a piston-powered copter. Nautical miles are shown across bottom of chart.

T53 in Copters, VTOL's and Airplanes

The helicopter version of the T53 is committed for production of two aircraft — the Army's Bell H-40 and the Air Force's Kaman H-43B. It is also the powerplant for several research vehicles, including the Doak Model 16, Ryan Model 92, Vertol 76 and Vertol 105. The turboprop version of the engine is committed for production of the Grumman AO-1 and the OF-1.

These varied applications of the engine demonstrate the basic versatility of the Lycoming turbine unequalled thus far in the race for the turbine market. They cover ducted fan, deflected slipstream and tilt wing approaches to STOL-VTOL. The free power turbine arrangement allows for a wide selection of rpm. for any given power. The basic engine design is adaptable to power extraction at either the front and/or rear, although current models do not provide for a rear drive. The small diameter and short length permit applicability for almost unlimited helicopter and aircraft designs, and for marine and industrial uses.

The Bell and Kaman helicopter installations provide casebook examples of the T53 versatility. The H-40 illustrates the possibilities in design provided by the use of turbines, since the ship was the first helicopter spe-

cifically designed around a turbine powerplant. The H-43B illustrates the adaptability of the T53 for retrofitting a previously existing, reciprocating-engine-powered copter with only minor airframe changes. The engine is mounted on top of the cabin between the tail booms and behind the rotor shaft in contrast to the previous installation in which the reciprocating engine was installed inside the rear of the fuselage.

Ease of Maintenance

Another advantage offered by the Lycoming turbine is its ease of maintenance. Since the power turbine is mechanically independent from the gas producer, the whole power turbine assembly, as well as the combustor, can be readily removed without disrupting any rotating parts of the gas producer. When this assembly is removed, all hot parts, such as the combustor liner, fuel vaporizing nozzle, turbine wheels and stators, are accessible for inspection or replacement.

During field operations with the Bell H-40, it was necessary in one case to remove the combustor of the engine to send it from the Bell plant in Texas to the Connecticut headquarters of Lycoming. The combustor was removed, leaving the major part of the engine installed in the aircraft. Complete removal and re-installation of the engine has been accomplished in 15 minutes.

To meet the demands of heavy field use, the T53 was designed with ruggedness built in. When a chunk of magnesium was swallowed by the compressor rotor of an engine on test, the axial compressor blades were twisted and bent, but not a single blade was broken. A further example of the ruggedness and safety features of the engine is that the engine's folded combustion chamber design provides four layers of steel shielding around the turbine wheels.

The ruggedness factor of the T53 leads into that question of paramount interest — cost. Elimination of the delicate latter compressor stages eliminates an expensive manufacturing problem. By using twisted sections of precision rolled airfoil strips for compressor stators, Lycoming has radically cut production costs for stator vanes. Similar techniques are being evolved to further reduce the production cost and the T53 therefore promises to cost less than any turbine engine in its power class. Because of the adaptability of the basic T53 engine for industrial and marine uses, Lycoming is in a position unique in the field to develop standardized, economical production operation in the future.

This Kaman H-43B has a Lycoming T53 which replaced its piston engine for large savings in weight and installation space. Tests with it are proving practical possibilities for retrofitting piston-engine copters with new turbines.

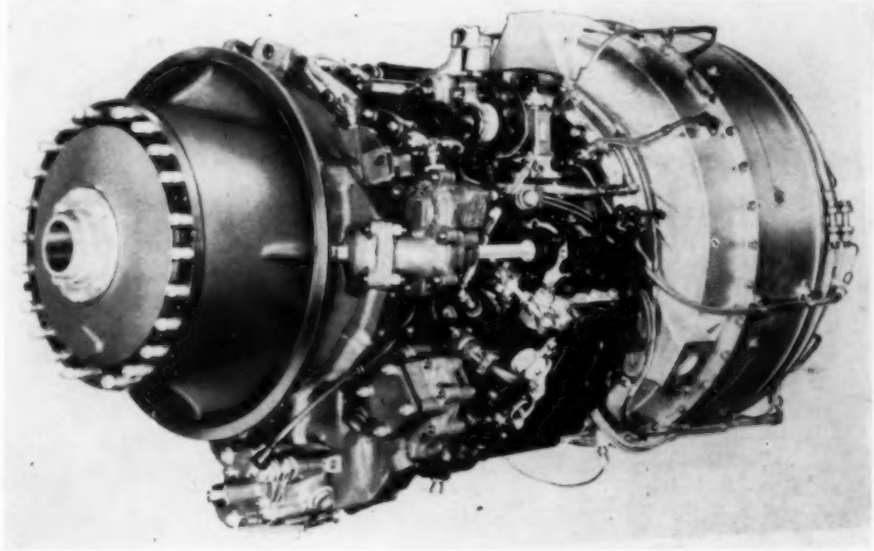
Field Operations

Field operations with the Lycoming engine have demonstrated further advantages of the turbine in helicopter operation. One is "hands-off" control of the engine power, since the powerplant is controlled automatically once the engine operating conditions are selected by the pilot. No preheating of the engine is required in cold climate operations. Indications are that the engine will achieve its goal of 1,000 to 1,500 hours time between overhauls — this as compared to 300 to 600 hours for the current large helicopter piston powerplants.

Although the T53 is currently rated at 825 shaft horsepower, it has been run at more than 1,000 shp. and better for extended periods. Lycoming's modified Kaman with the T53 has reached the 15,000 foot level — Lycoming is the first engine manufacturer in the nation to conduct its own flight test program on a turbine-powered helicopter. The Bell H-40 has flown at the 15,000 foot level, also. During recent altitude and cold tests in the laboratory facilities at Wright-Patterson Air Force Base, the T53 was successfully started at temperatures down to minus 65°F. Successful sustained operation of the engine was accomplished up to altitudes of 40,000 feet — the maximum altitude attempted.

Currently, Lycoming is putting the T53 through its 150-hour test to complete the qualification necessary before large scale production is initiated. Among those observing the test

(Continued on page 55)



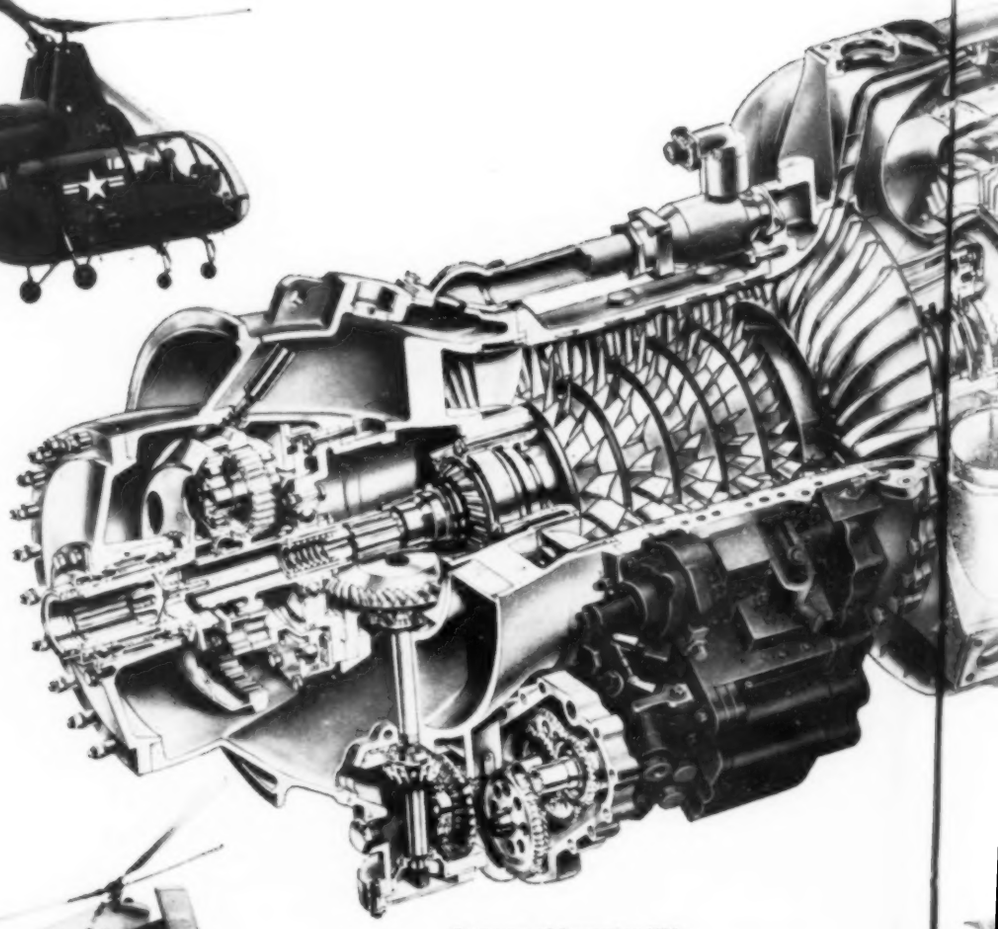
Compact T53 has 23-in. diameter and 47.6-in. length. Prototype — rated at 825 shp., field-test engines have delivered over 1,000 shp. Weight is 480 lbs. with Lycoming's lowest fuel consumption quoted being 0.673 lbs. per eshp. Normal rated continuous power is 770 hp.

Lycoming's T53

PROVEN . . .

Low-cost T53 Registers More Hours Of Flight

Kaman H-43B



Cutaway of Lycoming T53

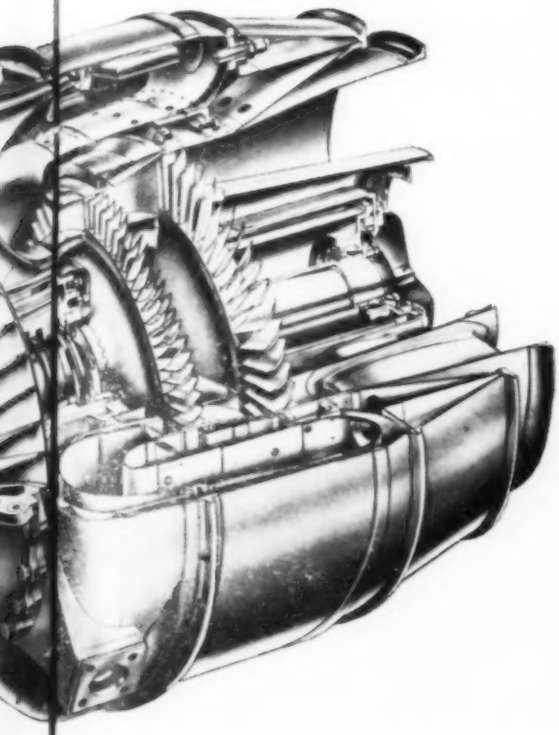
Vertol Model 105

Grumman Model AO-1

Bell H-40

IN FLIGHT

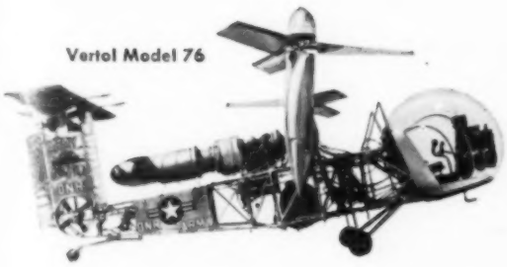
Time Than Any Other Comparable Turbine!



Its remarkably low production costs is but one reason why 6 major aircraft companies have selected the T53. Installed in the Bell H-40 and Kaman H-43B helicopters, the T53 has already earned a reputation as an engine "You can kick" and "Don't need to baby in flight." In addition, the T53 was chosen to power Grumman's new AO-1 High-Performance Observation Airplane as well as Vertol's Model 76 tilt-wing aircraft and Model 105 helicopter, a turbine-powered version of the H-21. The Ryan Model 92 and Doak Model 16 research aircraft—now being readied for flight—will also use the T53. In flying time experience, the T53 has recorded *more hours* than any other turbine engine in the same power class!

Built under the sponsorship of the U. S. Army and the U. S. Air Force, the low-cost T53 has also been installed in a power package for a high-speed U. S. Navy boat. Its easy adaptability to all sorts of applications has therefore been proven in practice.

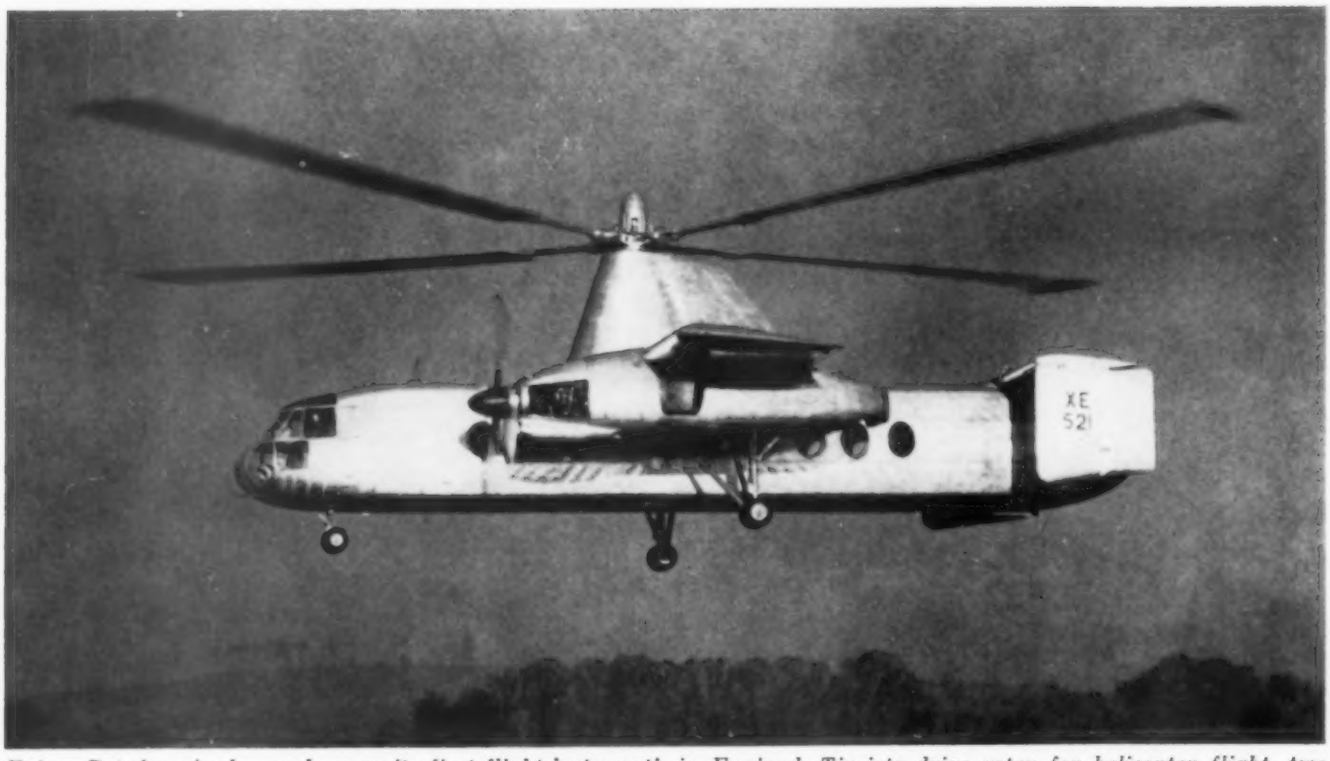
Right now, the T53 helicopter version offers 825 s.h.p., but that rating will increase to over 1,000 s.h.p. in the foreseeable future. The current turbo-prop version delivers 1,005 e.s.h.p. from a compact 47.6″ length x 23″ diameter. The T53 operates on a number of fuels, including automotive and aviation gasolines and JP-4. Now nearing full production, Lycoming's T53 is designed especially for safety, durability, easy maintenance, as well as high power with low weight. Perhaps it can solve your future problems now!


Vertol Model 76

Look to Lycoming

For further information, write to: Lycoming Division, Avco Manufacturing Corporation, 550 South Main Street, Stratford, Connecticut.

AVCO Lycoming



Fairey Rotodyne is shown above on its first flight last month in England. Tip-jets drive rotor for helicopter flight, two 3,500-hp. turboprops provide forward thrust for 200-mph. speed.

Rotodyne Airliner

FAIREY Aviation Co., Ltd., in England, last month made the first flights with its big Rotodyne, a 17-ton convertiplane airliner for 48-passenger service on feeder air routes. The vertical-take-off prototype rose to a height of 230 ft. on its first hop and has since made other successful flights.

Two 3,500-hp. Napier Eland turboprop engines provide conventional thrust for forward flight and drive auxiliary compressors which feed compressed air by ducts to the blade tips of the 90-ft.-diameter rotor. At the tips, the air is mixed with fuel and burned in small Fairey pressure-jet engines which drive the rotor for vertical flight. No details were given for the pressure-jet engines.

Tip-jet drive eliminates gears, shafts and clutches. Once airborne helicopter fashion, turboprops take over and the rotor is free-wheeled to share the lift with the stubby fixed wing for forward flight. Normal range with 48 passengers is 400 miles at 185-mph. cruising speed. Helicopter take-off and landing capability eliminates the need for large airports, the Rotodyne being intended for operation from city centers.

Stub wing of Rotodyne prototype is shown at left. Test Pilot Ronald Gellatly made first hop. Note cockpit visibility for vertical take-off and landing.

Flying ease and safety factors prove copter is old man's airplane

You're Never Committed

By FRED L. ROSCOE
Commercial Domestic Sales Manager, Bell Helicopter Corp.

BUSINESS pilots in increasing numbers all over the country are finding out that helicopters have been perfected to the point where they will do a man-size job of executive transportation. They will do this easily, safely and dependably — but they never commit the pilot. Without exception, fixed-wing pilots buying executive 4-place Bell Model 47J's find them easy to fly with far more safety "outs" than the airplane offers.

The Bell is the original "old man's airplane" and more — the pilot is never — we repeat never — committed as he is in a fixed-wing aircraft on take-off, approach, landing, or whatever. It is like an aircraft with ailerons on all four ends — maybe it should be called the "omni-bird." If the old eye and reflexes are finding it tiresome to cut those ILS's at 200 ft. and a half a mile, 130 knots and slippery when wet, how would you like to ease over the back fence out of everybody's way at 30 knots and sit down, anchored? If you start a take-off and don't like it — stop. If you change your mind on approach — turn. If you aren't sure of your landing spot after you arrive right on top of it — move over to a better one. You don't have to reach 90 knots before you know for sure you'll fly — in a helicopter, you simply lift off a foot or two, right in the tie-down area, and if your engine check isn't all you want it to be, sit back down right on the spot. You're never committed in a Bell.

The main reason more and more pilots are getting Bells, however, is the helicopter's practical ability to solve ground transportation problems. It is a flying station wagon for travel between plant and airport, an ideal stable-mate for executive transports which are having to move farther out in the country as airports move out to accommodate faster, bigger airplanes.

EASE OF HELICOPTER FLYING is demonstrated by 12-year-old Gustavo Stroessner in this picture made by Joe Mashman of Bell Helicopters on a sales tour of South America. Son of the president of Paraguay, Gustavo's instructor, Capt. Alberto Fragnaud, is merely a passenger — note that this Bell does not have dual controls. Mashman pronounced the boy an expert, let him fly the new 4-place Bell 47J with his distinguished father as passenger. Numerous heads of state personally use Bell helicopters, including President Dwight D. Eisenhower.

Pilots Invited to Factory

Here is a personal invitation to any corporate pilot with a ground-transportation problem — Bell Helicopter wants you to visit our factory between Fort Worth and Dallas to become acquainted with the best flying any pilot ever did. We'll hop you. We have a factory pilot training school. In fact, we're thinking of setting up a special course for executive pilots, tailered especially to fit pilots with years of experience behind them. Maybe we can put this together early in 1958 — if enough corporate pilots are interested, we'll expedite it.

Meanwhile, here are some sample comparisons which we can back up with demonstrations any time you're ready:

Practice touch and go landings — 100 per hour in a Bell; 10 per hour in an airplane. Complete landings with dead engine — anytime and anywhere in a Bell; airport only with long runway in an executive transport. Area for training — anywhere in a Bell; airport for airplane. Elementary controls — two sticks, a throttle and rudder in a Bell; stick, throttle, rudder, brakes, flaps, and steerable nosewheel or tailwheel in airplane. Fuel stops — airports and auto stations in a Bell; airports only for airplane. Unexpected weather restrictions — land anywhere or ease along at a snail's pace or any slow speed necessary in a copter; in an airplane, immediately go IFR but if unable, make a 180-deg. turn and hope for the best in getting out of it. Busy terminal areas of high density traffic — enter from any direction in a cop-

(Continued on page 55)

America's No. 1 heliport is the White House lawn, shown here with President Eisenhower's 4-place Bell 47J. So safe is the Bell that Ike is the first president permitted to fly in a single-engine aircraft. Many industrialists now use copters for travel to and from their factory doorsteps.

City Heliport Criteria

ONE of the helicopter industry's brightest hopes is the increased utilization of corporate, sometimes known as "executive," helicopters and air-taxi or charter copters used in city flying. But one of the greatest obstacles blocking this expansion of helicopter operations is the lack of local planning and acceptance of landing areas and access routes or fly-ways for helicopters in hundreds of American cities and communities. While hundreds of commercial and privately-owned helicopters have established the chopper's chief asset as being its ability to operate safely and efficiently to and from city centers, these city centers are too frequently found closed to helicopters. The reason always is the same — city and local authorities in most areas have few or no standards or guides to go by in approving sites for heliports and access routes.

The various manufacturers of commercial helicopters are in the process of drafting suggested criteria for local use, and their suggestions will be available to cities and other local authorities during 1958 as dependable reference guides. The manufacturers are compiling these guides individually and as an industry group, so that a city may soon be able to obtain industry-recognized and accepted criteria for helicopters in several classifications by weight, such as machines weighing up to 3,000 lbs., up to 8,000 lbs. and up. The Helicopter Council of the AIA will issue a compilation of criteria from the various company guides.

At the same time, some cities are in the process of formulating their own standards by which proposed public and private sites for helicopters will be approved.

The outlook is that sufficient standards will have been established during 1958-59 for any city to have access to nationally-accepted criteria. These will remove the doubts and confusion now blocking local approval of sites and it is hoped that many hundreds of areas will be approved for operations, thus opening the way for fullest possible utilization of helicopter advantages in built-up areas.

One of the most practical approaches to a company guide for local

This 40-ft. square platform is typical of offshore oil well drilling rig heliports off the Louisiana coast.

authorities is that taken by Bell Helicopter Corp., one of the industry's pioneers. Bell's criteria are for its own models of small commercial helicopters or any other helicopters weighing as much as 3,000 lbs. or so. The primary aim is to establish reasonable *minimum* criteria for the small heliport or helistop, with Bell offering advice and recommendations based on the worldwide operations of some 2,000 Bell machines over a span of 2,500,000 flying hours. Its suggestions are intended for the "average" situation only.

In any consideration of sites and access routes, Bell emphasizes that there are definite CAA regulations covering the design of helicopters and governing the helicopter pilot and mechanic. Accordingly, it must be assumed that these regulations are complied with in any helicopter operation associated with heliport suggestions the company offers. Airworthiness of the

Unpretentious helipad atop hospital is all that's needed by this Bell owned by Douglas Aircraft.

helicopter as a machine and proficiency of pilots and mechanics are thus accepted as having been assured by CAA regulations, so that local authorities need not concern themselves on these points any more than they are concerned with airplane operations from airports used by fixed-wing aircraft.

Heliport Dimensions

Helicopters have long since proved that they can be hovered and maneuvered with precise accuracy so that the actual size of a landing spot need be only that space required by the machine itself. But a fence is needed to keep unauthorized people out of the actual operating area, as small as it is, and the fencing itself has become the determining factor in considering minimum dimensions for a heliport. So that the pilot can be sure his helicopter is within and clear of the fence, a standard CAA heliport marking and

Lawn of Thompson Products factory in Cleveland provides an excellent heliport for executive copters.

possibly a circle should be painted in the center of the fenced area as reference. It is typical for the landing pilot to make an approach over the fence, coming to a hover a few feet above the landing spot in the center. Once over this spot, he then descends vertically and lands. With this in mind, Bell feels its Model 47 helicopters can be operated safely in fenced heliports about 100 feet square and in rooftop or elevated platform heliports only about half that size, although it qualifies these dimensions by calling them "general or average" as minimums. Roof or elevated heliport pads usually have inclined fences, which are to keep people from falling off as they walk about on the platforms. Heliport fences need be only three or four feet high.

For heliports where more than one helicopter will operate simultaneously,

Smallness and simplicity of helistops are seen in this air view of a motel with a pad for helicopters.

adequate clearance must be provided between landing spots to minimize rotor downwash interference between the two machines if they should hover simultaneously. Under most conditions, the distance between the rotors of two Bell helicopters should be at least equivalent to one rotor diameter, which is just over 37 ft. for the Bell 47J. This would indicate a minimum distance of something like 75 ft. between the centers of two adjacent landing spots. As a general rule, the square or rectangular shape is convenient for heliports, although circular and irregular shapes are being used.

Location of Heliport

Since it is typical for the helicopter to approach and climb out on steeper slopes than 1-to-8, adequate clearance of obstructions will be insured if approaches to a heliport provide a slope of 1-to-8 (about 7 degrees measured from the horizontal). In some cases,

(Continued on page 76)

This Cleveland factory has its own little heliport across the driveway from its busy shipping dock.

Mock-up scenes show advanced helicopter cockpit concept using contact analog screens. Moving grids on screens furnish blind flight information such as altitude, speed, turns and other maneuvers. Inset photo at left shows instrument console with round screen at bottom for navigation display.

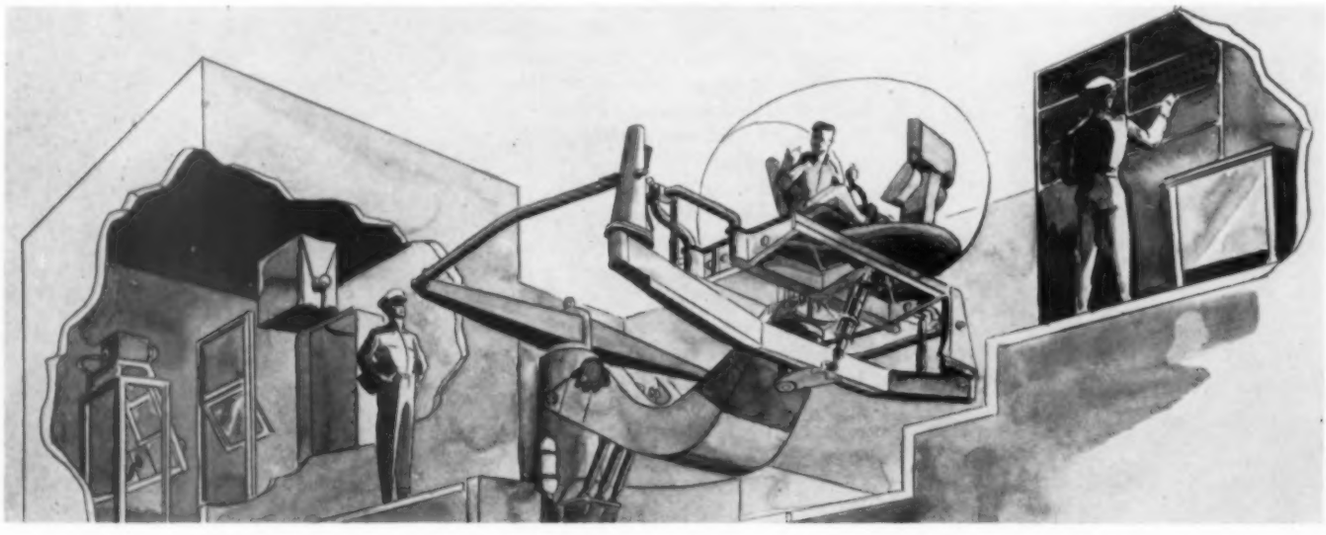
New Helicopter Instrument Presentation

UNABLE to see the horizon or anything else outside the cockpit, the average helicopter pilot will soon be able to fly by simple reference to a screen giving him a synthetic representation of the hidden landscape. Instead of interpreting a panel of instruments, he will merely glance at grid lines and other pictorial matter on the screen which will relate the helicopter's attitude and position in relation to the horizon and check points on the ground.

This artificial pictorial presentation is known as the "contact analog" system. Its first helicopter applications are being made by Bell Helicopter engineers in a new and unique helicopter flight simulator. Work on it originated two years ago under the Office of Naval Research, with Bell handling the helicopter portion and Douglas Aircraft the fixed-wing aircraft portion of the Army-Navy Instrument Program (ANIP). The basic idea is to fit aircraft to man's capabilities and limitations rather than condition man to aircraft demands, as aviation has been attempting to do.

Bell engineers have built a new helicopter flight simulator as a scientific means of testing the responses of untrained subjects as well as experienced pilots to new kinds of flight information displays. The flight simulator, a helicopter cabin, will be mounted on a dynamic platform, built by the Franklin Institute of Philadelphia, which will animate the simulator with the

Bell's initial dynamic flight simulator for helicopter program (cockpit transparent here for purposes of illustration only). Instrument console has contact analog screens. Machine would simulate actual flight motions.



basic motions of pitch, roll, yaw and heave. Static simulators have never achieved the new device's sensation of flight realism.

Synthetic "Contact" Flying

In front of the pilot will be a screen, called the contact analog display. It will synthetically picture for him the same visual cues he would use on a clear day for contact flying. Elsewhere in the laboratory, an engineer at a control panel can feed new or additional flight conditions into the pictorial presentation, by which the pilot makes necessary corrections. His response is recorded and evaluated. This evaluation will determine future developments to simplify cockpit presentations.

The screen currently gives the pilot such "contact" information as altitude, speed, turns and other maneuvers. These are pictured by moving grid patterns. An electro-mechanical contact analog generator for the simulator was designed and built by Bell engineers. The Allen B. DuMont Laboratories are perfecting a compact all-electronic contact analog generator for Bell. It will be installed and flight-tested early in 1958 in a Bell helicopter.

For Average Pilot

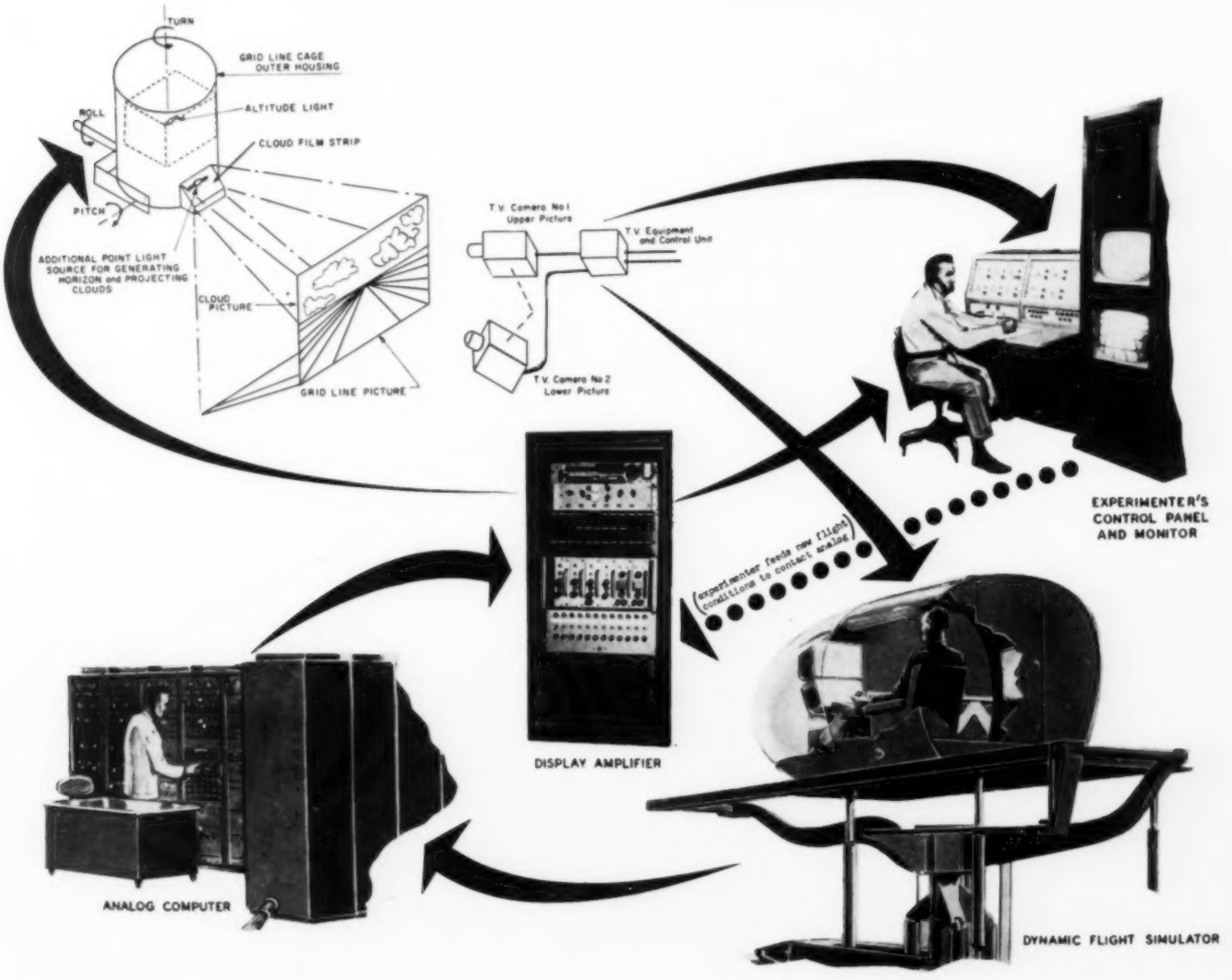
The Bell simulator is the first equipped to simulate blind flight in a helicopter. Its primary function is that of preflight evaluation of displays developed under the Army-Navy Instrument Program and measurement of man's ability to interpret the information as displayed. Perfected, contact analog is expected to enable an "average" pilot, with as little as 20 hours of flight instruction, to fly safely in a helicopter, day or night, under all weather conditions, says Bell.

Bell Helicopter's portion of the ANIP is directed by Owen Q. Niehaus, chief of Bell's servo electronics laboratory; Dr. Guy Matheny and Project Engineer Hugh Upton. All are under general supervision of Bell's vice president for engineering, Bartram Kelley.

Current helicopter instrument flight simulators are reworks of fixed-wing aircraft flight simulators, Niehaus points out. "Our flight simulator is the first of its kind," says Niehaus. "It represents a new concept in that it is being designed and built with the characteristics of helicopter flight foremost in mind."

While first tests are projecting on the screens information giving altitude, speed, turns and other maneuvers, other segments of information will be added later to the contact analog and presented along with mechanical conditions and navigation indications. Ultimately these laboratory studies will determine what information is necessary for all helicopter flight conditions and the best presentation methods for optimum pilot reaction.

Schematic diagram shows dynamic helicopter simulator laboratory components and the flow of information, controls and responses. Various techniques for displaying flight information will be tried out on pilots in the simulator. Bell is the industry coordinator of the Army-Navy sponsored rotary-wing instrument program.



Super 18 executive transport (top) and Twin-Bonanza. At 9,300-lb. gross, Super 18 has 3,250-lb. useful load, seats 6 to 8, tops 234-mph. and sells for $117,975. Six-place Twin-Bonanza (below) is available in $88,000 F50 version with 240-mph. top speed and 2,540-lb. useful load at 7,000-lb. gross and in $77,000 D50A version with 214-mph. top speed and 2,210-lb. useful load at 6,300-lb. gross.
—(Beech Photos.)

Beechcrafts For 1958

By TOM ASHLEY

UNVEILING of the 4-place Travel Air small twin and Continental fuel injection for the 4-place Bonanza sparked Beech Aircraft Corporation's annual international sales meeting in Wichita last month, with 375 distributors, dealers, sales and service representatives previewing 1958 Beechcrafts and celebrating $35,750,000 worth of business plane sales for 1957 — up $3.6 million from 1956 for a new dollar-volume record to round out the firm's 25th anniversary year.

In addition, Beech Vice President Jack Gaty disclosed the first sale of a twin-jet business plane in America to Henry Timken, the industrialist. His will be one of two 400-mph. French-built Morane-Saulnier MS-760 4-place jets bought outright by Beech, which also optioned 8 others for 1958-59 deliveries. The second one will be a factory demonstrator. Before manufacturing a commercial jet of its own design, Beech has chosen to handle the French speedster under license. It doesn't expect any other commercial business jet to be licensed for use within three or four years. Price of the two 760's has not been finalized under the arrangement, but the figure is believed to be within the $200,000-$250,000 bracket including 15% import duty. CAA licensing is expected to be completed soon, with delivery of the first two planes following immediately. Four of the jets will be available in 1958.

Thus the Beechcraft line of 1958 business planes will be as follows:

Four-place, 210-mph. J35 Bonanza, with 250-hp. fuel-injected Continental IO-470-C engine, $24,300, up $1,650 from last year's H35 ("I" model designation skipped in favor of "J").

Four-place, 209-mph. Model 95 Travel Air, with two 180-hp. 4-cylinder Lycoming engines, $49,500.

Four-place, 400-mph. MS-760 Twin Jet, powered by two French-built Turbomeca Marbore turbojets rated at 880 lbs. of thrust each, $200,000-$250,000, with only 4 airplanes available in 1958.

Six-place, 240-mph. F50 Twin-Bonanza, powered by two 340-hp. supercharged Lycomings, $88,000, and D50A version with 295-hp. unsupercharged engines, $77,000, no price change.

Eight-place, 234-mph. Super 18 transport, powered by two 450-hp. P & W engines, $117,975, up $11,000.

Because it is the newest Beech model, the little Travel Air twin stole the show at the annual meeting. Destined to become Beechcraft's Cadillac of the air, the Travel Air is the quietest business plane flying and is built up from components of other Beechcrafts which have proved themselves down through the years. These include cabin from the Bonanza line, tail and landing gear from the Mentor trainer line, wing tips designed after the new tips on the Super 18 and Mentor wing with Twin-Bonanza leading edge. The Travel Air is being introduced to fill the gap in the Beech line between the Bonanza and the Twin-Bonanza. It is designed as the small twin to which Bonanza owners will graduate for want of twin-engine capabilities in around-the-clock flying and as the small twin from which owners will graduate into the larger Twin-Bonanza.

Travel Air useful load is a generous 1,450 lbs. at a 4,000-lb. gross weight and 2,580-lb. empty weight. With standard fuel capacity of 84 gals., full tanks provide a 916-lb. allowance

Model 95 Travel Air (top) is new $49,500 Beechcraft 4-place small twin. Two 180-hp. Lycomings give it 209-mph. top speed at 4,000-lb. gross weight and 1,420-lb. useful load. Latest Bonanza is $24,300 J35, first business plane with fuel injection. Continental engine of 250 hp. gives it 210-mph. top speed and 175-mph. cruise speed on 50% power, with 1,080-lb. useful load at 2,900-lb gross weight.

—(Beech Photos.)

for people, optional equipment and baggage. Optional equipment includes auxiliary wing tanks boosting total fuel capacity to 112 gals., sufficient for 1,100 miles at 192 mph. or 1,410 miles at 165 mph.

While it offers excellent cross-country travel speeds, including 200-mph. cruise at 7,500 ft. using 75% power and 192 mph. using 65% power at 10,500 ft., it also provides outstanding short-field performance including 1,025-ft. take-off over a 50-ft. obstacle and 950-ft. landing over a 50-ft. obstacle, these being at gross weight and sea level. Stall speed is 60 mph. with power and with flaps and gear down and 70 mph. without power but with flaps and gear down.

Impressive single-engine performance has been demonstrated by the Travel Air. Minimum single-engine control speed is down around 84 mph., which is obtained quickly in the take-off due to rapid acceleration. Single-engine rate of climb at sea level is 225 ft. and single-engine absolute ceiling is 8,000 ft. at gross weight, with single-engine service ceiling at 6,200 ft. at gross weight. Best single-engine rate of climb speed at sea level is 101 mph.

Twin-engine rate of climb at sea level is 1,360 fpm. with 105 mph. for best rate of climb. Cruising climb at 150 mph. is about 700 fpm. Service ceiling is 19,300 ft. and absolute ceiling is 20,900 ft. These figures are for gross weight.

The Travel Air is powered by two Lycoming O-360-A1A engines rated at 180 hp. at 2,700 rpm. each for all operations — America's most powerful 4-cylinder aircraft engine. Fuel consumption at 75% power for 200-mph. cruising speed at 7,500 ft. is 21 to 22 gals. per hour. Constant-speed, quick-feathering, 72-in.-diameter Hartzell propellers are used. Optional for them are diaphragm pressure-type accumulators for quick and easy unfeathering. The upper part of each accumulator is charged with dry air or nitrogen to 130 psi. while the lower part contains engine oil pressure from the Woodward hydraulic governor. When the propeller control is pulled back past the detent into feathering position, a valve is closed to trap the oil in the accumulator. When the propeller control is moved all the way forward from the detent, the trapped oil is released, thus providing quick and easy unfeathering for air starts without the use of the starter.

Exhaust augmentor tubes were on the Travel Air prototype but these have been eliminated and electric cowl flaps are on the production model. They made possible smaller nacelle frontal area. Standard engine equipment includes 15-amp. generators, for which 25-amp. optional generators are available as replacement. Its 24-volt electrical system is provided with one 17-amp.-hr. 24-volt battery, with optional equipment including two 24-amp.-hr. 12-volt batteries connected in series.

In addition to the Bonanza's baggage compartment behind the rear seat, the Travel Air has a nose compartment for radio gear, battery, 35,000-BTU combustion heater, and some baggage. Each compartment has a 270-lb. maximum capacity. Equipment in the nose compartment takes up space so that it appears only small bags can be fitted into it, but a relocation of the battery in the nose might clear sufficient space for a two-suiter.

Bonanza and other single-engine pilots will probably make the Travel Air the most discussed airplane in the field as distributor-dealer demonstrators begin making the rounds, for ease of flying and excellent flight characteristics will give hundreds of pilots confidence in their ability to handle a small twin. It will get off the ground within a few hundred feet and accelerate very rapidly, with the landing gear retracting in only 4 seconds. High rates of climb will be very impressive to newcomers and stall characteristics with complete aileron control which can only be described as "fantastic" will win a lot of friends. Stability at high speeds and in turbulent air will be in sharp contrast to

Beech Model 95 Travel Air

Factory Data

Powered by two Lycoming 4-cylinder O-360-A1A engines, each rated at 180 hp. at 2,700 rpm. for all operations and equipped with Hartzell 72-in. full-feathering, constant-speed propellers with Woodward hydraulic governors.

Price	**$49,500**
Gross Wt., lbs.	**4,000**
Empty Wt., lbs.	**2,580**
Useful Ld., lbs.	**1,420**
Fuel Cap., gals.	**84**
Opt. Fuel Cap., gals.	**112**
Oil Cap., qts.	**16**
Top Spd., sea level, mph.	**209**
Cruising Speeds— Mph.-pct. hp.-rpm.-alt.-ft.	**200-75-2450- 7,500 192-65-2300-10,500**
Range, 65% hp., 112 gals., mi.	**1,100**
Max. Range, 165 mph., mi.	**1,410**
Rate of Climb, fpm.	**1,360**
SE Rate of Climb, fpm.	**225**
Svc. Ceiling, ft.	**19,300**
SE Svc. Clng., ft.	**6,200**
Stall Spd., mph.	**70**
Take-Off over 50-ft. obstacle, ft.	**1,025**
Landing over 50-ft. obstacle, ft.	**950**
Span, ft.-ins.	**37-10**
Length, ft.-ins.	**25-4**
Height, ft.-ins.	**9-6**
Wing Area, sq. ft.	**193.8**
Wing Loading, lbs. sq. ft.	**20.6**
Pow. Loading, lbs. hp.	**11.1**
Cabin Dims., length-width-height, ins.	**83-42-50**
Cabin Door, ins.	**36-37**
Bagg. Dr., ins.	**24-22**
Bagg. Compt., cu. ft.	**16.5**
Util. Compt., cu. ft.	**13**
Bagg. Cap., front and rear, ea., lbs.	**270**

NOTES: Performance is at gross weight and sea level unless noted and is guaranteed within 3%.

experiences of many pilots. One impressive demonstration is to dump the landing gear at 180 mph. or so with hands and feet off the controls. Nothing happens — the Travel Air's nose rises slightly, lowers momentarily and then resumes its original trim position. As for short-field performance, the Travel Air as a barnstorming airplane will go anywhere a single-engine Bonanza will go.

Front and rear seats are standard Bonanza items and no alternative seating is offered. Purchasers no doubt will soon be coming up with custom seating for rear-seat passengers in the Travel Air. Other manufacturers of light twins have already gone into customizing of rear seats to provide individual chair-type units.

New J35 Bonanza

The big stride for business planes has been taken by Beech in its J35 Bonanza by offering Continental's new continuous-flow, multi-nozzle fuel injection system on the 6-cylinder, IO-470-C engine. Fuel injection gained 10 hp. for the engine, without change in compression ratio, crankshaft speed or fuel, and it is rated at 250 hp. at 2,600 rpm. for all operations.

The fuel injection system is described elsewhere on pages 49-51. Its contributions to the Bonanza are significant and can be summarized as follows: Freedom from icing, smoother engine operation, increased engine power, more fuel economy, hair-split leaning and mixture control, lower head temperatures, accurate fuel consumption and control, improved starting, better acceleration, no flat spots off idle, freedom from gravity effects, greater reliability, decreased maintenance, and added safety.

In brief, the Continental injector system eliminates the carburetor and its complications and injects raw fuel directly into each cylinder through the intake valve port. Air never mixes with the fuel in the system, entering the cylinder separately from the fuel. The system has no running parts, except a typical engine-driven fuel pump.

With the 250-hp. engine, the J35 Bonanza has the same 2,900-lb. gross weight as last year's H35 but useful load is 1,080 lbs. as compared to 1,067 for the H model. The 82-in. diameter of the constant-speed propeller is 2 ins. less than that of the H model. Handling characteristics of both airplanes are identical.

Speed, however, has gone up with the J35. Top speed is 210 mph. at sea level, cruise is 200 mph. at 75% power and 7,000 ft. and 195 mph. at 65% power at 10,000 ft. Speeds for the H35 were 206-mph. top, 196 mph. at 75% hp. and 5,000 ft. and 190 mph. at 65% power at 8,000 ft. The J35 has an economy cruising speed of a hefty 180 mph. at 10,000 ft. using only 55% of power and will cruise 175 mph. on 125 hp., which is 50% hp.

Standard fuel capacity is 39 gals. with 57-gal. optional capacity available. Range with 57 gals. is 1,060 miles at economy cruise of 180 mph., 10,000 ft. and 55% power.

The J35 has a structural cruising speed of 185 mph. indicated air speed for the upper end of the green arc on the air speed indicator.

Rate of climb for the J is the same at sea level as for the H at 1,250 fpm. but the J has a 21,300-ft. service ceiling as compared to 19,800 ft. for the H35.

New for the J35 is the factory's optional installation of the 9-lb. Tactair T-3 autopilot, at a price of $2,850.

Twin-Bonanza

New for the F50 and D50A Twin-Bonanzas are oil-squirt-cooled pistons

Beech J35 Bonanza

Factory Data

Powered by a Continental IO-470-C 6-cylinder engine rated at 250 hp. at 2,600 rpm. for all operations and equipped with Continental fuel injection system. Beech propeller with aluminum alloy blades, hydraulically-controlled continuously variable pitch, series 278, diameter 82 ins., with Woodward hydraulic governor and Beech spinner.

Price	**$24,300**
Gross Wt., lbs.	**2,900**
Empty Wt., lbs.	**1,820**
Useful Ld., lbs.	**1,080**
Fuel Cap., gals.	**39**
Opt. Fuel Cap., gals.	**57**
Oil Cap., qts.	**9**
Top Spd., sea level, mph.	**210**
Cruising Speeds— Mph.-pct. hp.-rpm.-alt.-ft.	**200-75-2450- 7,000 195-65-2450-10,000 180-55-2300-10,000**
Rate of Climb, fpm.	**1,250**
Svc. Clng., ft.	**21,300**
Stall Spd., landing with flaps, mph.	**57**
Cruising Range— Miles-gals.-mph.-alt.	**725-39-180-10,000 1,060-57-180-10,000**
Take-off Run, ft.	**670**
Landing Run, ft.	**400**
Baggage Cap., lbs.	**270**
Span, ft.-ins.	**32-10**
Length, ft.-ins.	**25-2**
Height, ft.-ins.	**6-4.5**
Wing Area, sq. ft.	**177.6**
Wing Loading, lbs.-sq. ft.	**16.3**
Pow. Loading, lbs.-hp.	**11.5**
Cabin Dims.,length-width-height, ins.	**83-42-50**
Cabin Door Dims., ins.	**34-37**
Bagg. Dr. Dims., ins.	**24-22**
Bagg., cu. ft.	**16.5**

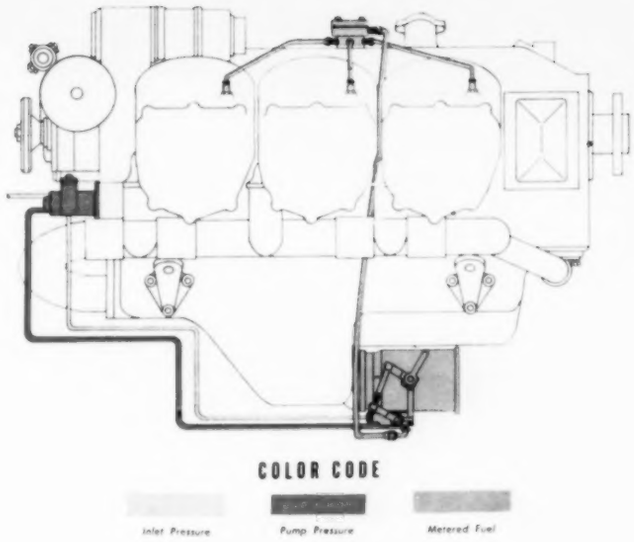
NOTES: All performance, for sea level and gross weight, unless specified, guaranteed within 3%. Empty weight includes complete set of flight instruments, cabin heating and ventilating system with windshield de-icers, soundproofing, constant-speed propeller, navigation, cabin, instrument and landing lights and unuseable fuel and oil. Engine equipment includes 50-amp. generator.

for the supercharged 340-hp. Lycomings in the F50 and the unsupercharged 295-hp. Lycomings in the D50A and optional features include air-oil accumulators for quick and easy propeller unfeathering and cabin divider curtains. Engine nacelles have been cleaned up with removal of crankcase breather outlet and vacuum oil separator vent. Maximum flap extension speed for the D50A has been raised from 135 mph. to 150. Other new Twin-Bonanza features include new rear and front seat heat controls for temperature balance, cabin heat rheostat changed to allow higher heat settings, new lighted dual-scale free air temperature indicator, more baggage space through relocation of oxygen bottle, double-pane windows for improved quietness, improved entrance step gear mechanism, improved molded glare shield across instrument panel, and remote filler valve for oxygen bottle refilling.

Complete performance and specification details for the Bonanza, Travel

(Continued on page 80)

Continental Fuel Injection



Fuel injection system has only 4 parts — pump (left), control unit (bottom), fuel manifold (top) and discharge nozzles. From pump, fuel flows to control unit where fuel pressure is metered in proportion to air flow. Valve atop engine divides fuel for each cylinder.

THE Continental Motors fuel injection system is a simple, low-pressure, continuous-flow type which controls fuel flow to match engine air flow, injecting fuel into the intake valve port in the cylinder head. It is designed for ready adaptation on engines of widely-varying power ratings, displacement and number of cylinders. There are four basic elements in the system — (1) Fuel Injection Pump, (2) Fuel-Air Control Unit, (3) Fuel Manifold Valve and (4) Fuel Discharge Nozzle, one for each cylinder. The pump pressures the fuel system. The fuel-air control unit regulates fuel and air. The fuel manifold valve divides the fuel so that each cylinder receives the exact same amount. The nozzle discharges the fuel into each cylinder. Operating principles are readily seen by tracing the fuel flow through the system in the accompanying sketches.

Fuel Injection Pump

Fuel enters the system at the swirl well of the vapor separator. Here, vapor is separated by a swirling motion so that only liquid fuel is fed to the pump. The vapor is drawn from the top center of the swirl well by a small pressure-jet of fuel and is fed into the vapor return line. This line carries the vapor back to the fuel tank. There are no moving parts in the vapor separator, and the only restrictive passage is used in connection with vapor removal. Thus, there is no restriction of main fuel flow.

Ignoring the effect of altitude or ambient air conditions for the moment, the use of a positive-displacement, engine-driven pump means that changes in engine speed affect total pump flow proportionally. The pump provides greater capacity than is required by the engine and, thus, a recirculation path is obtained. By arranging a calibrated orifice and relief valve in this path, the pump delivery pressure is also maintained proportional to engine speed. These provisions assure proper pump pressure and delivery for all engine operating speeds.

A check valve is provided so that boost pressure to the system can bypass the engine-driven pump in starting. This feature is also available to suppress vapor formation under high ambient temperatures of the fuel. Further, this permits use of the auxiliary pump as a source of fuel pressure in the unlikely event of failure of the engine-driven pump.

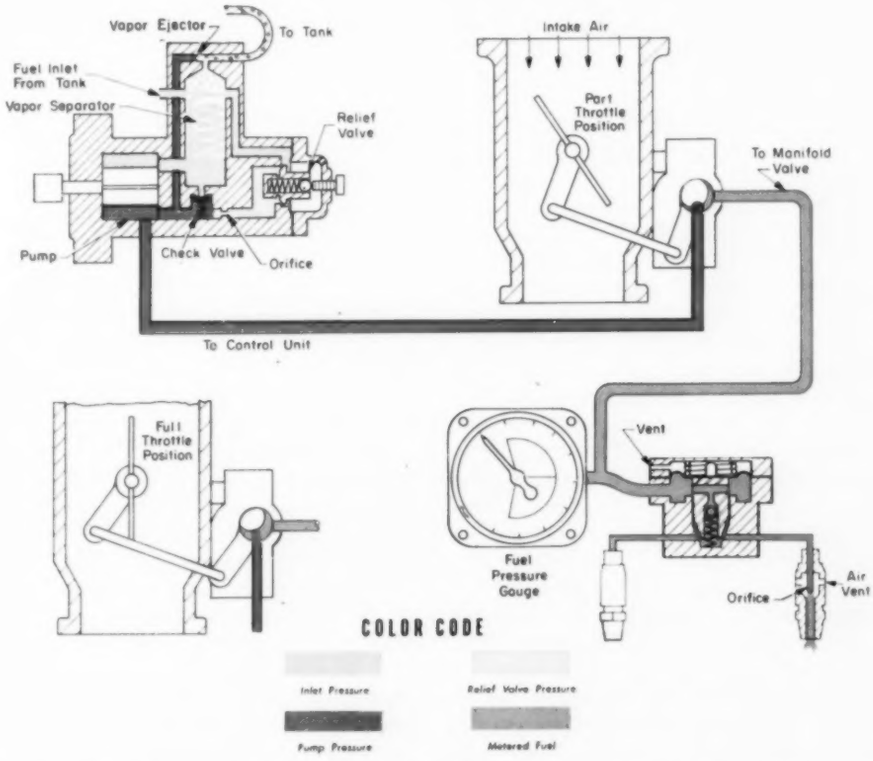
Fuel-Air Control Unit

The function of this assembly is to control engine air intake and to set the metered fuel pressure for proper fuel-air ratio. The air throttle is mounted at the manifold inlet, and its butterfly valve controls the flow of air to the engine as positioned by the throttle control in the aircraft.

Main fuel enters the control unit through a strainer and passes to the metering valve. This rotary valve has a cam-shape edge across the fuel delivery port. The position of the cam at the port controls the fuel passed to the manifold valve and the nozzles. By connecting the metering valve to the air throttle, the fuel flow then is properly proportioned to air flow for the correct fuel-air ratio.

Fuel Manifold Valve

From the fuel injection control valve, fuel is delivered to the fuel manifold valve which provides a central point for dividing fuel to the individual cylinders. In the fuel manifold valve, a diaphragm and plunger



Schematic diagram of Continental fuel injection system. Note pump's separation of vapor from fuel, returning it to fuel tanks to keep system vapor free. Position of air throttle determines metering of fuel pressure.

valve raises or lowers — by fuel pressure — to open or close the individual cylinder fuel supply ports simultaneously. A ball check valve under the plunger serves to insure that the plunger fully opens the outlet ports before fuel flow starts. Thus, there is no unbalanced restriction to flow in the fuel manifold valve. A fine mesh screen is included in the fuel manifold valve as additional protection of the injection nozzles against dirt or foreign matter.

Fuel Discharge Nozzles

From the fuel manifold valve, individual fuel lines carry the metered fuel to the fuel discharge nozzles, one for each cylinder. These are installed in the cylinder heads outside each intake valve. While a calibrated orifice is used, there is no valve and no structure of closely-fitted moving parts to be sensitive to dirt or icing. In fact, there are no moving parts.

An air bleed arrangement is incorporated in each nozzle. This aids in vaporization of fuel and, by breaking the high vacuum at idle, maintains the fuel lines solidly filled and ready for instant acceleration of the engine.

Thus, the four main components — together with fuel lines suitable for the installation — form the complete system as furnished by Continental Motors. Where necessary, cooling shrouds also will be provided and installed as protection against excessive nacelle temperatures.

Mixture Control

Mixture control operation is accomplished by a cam-and-double-port valve, which reduces the fuel pressure applied to the metering valve. It permits the operator to lean the mixture for most economical power at any operating point. Provisions are made for a gauge to read metered fuel pressure. This gauge permits simple and accurate adjustment of the mixture for any altitude and power within engine ratings.

Idle Cut-off

When the mixture control valve is placed in idle cut-off position (full lean), the fuel supply to the system is simultaneously by-passed back to the inlet side of the fuel pump and flow is cut off to the metering valve. In this process, the fuel manifold valve closes the lines to each nozzle so that the complete system is primed for easy starting.

Vernier-type mixture control below throttle in J35 Bonanza is for hairline leaning with altitude by fuel pressure indications (instrument above). Sea level power and full-throttle pressure are at high end of scale, decreasing with partial throttle and higher altitudes. Shaded areas are guide to precise fractional power settings.

—(Beech Photos.)

Bonanza Fuel Injection

By WILLIAM A. WISEMAN,
Chief Engineer and Director of Quality, Continental Motors Corp.

THE Beechcraft J35 Bonanza has made another step forward in power, performance and smoothness. The rugged Continental engine which powered last year's Bonanza has been developed into the new IO-470-C engine. The horsepower has been raised to 250 at 2,600 rpm. This has been accomplished with no change in displacement, no change in compression ratio, no change in fuel octane or rpm. and with a smoothness never thought possible in an aircraft engine. And the reason for this is because it is equipped with *fuel injection*.

The long awaited goal has finally been reached. It is a simple, reliable system designed and developed entirely by Continental Motors Corporation and time proven by over 3,000 hours of flight testing on many Continental aircraft during the last three years.

Now, what does fuel injection do for the 1958 Bonanza and why does it make it a better airplane? Here are the advantages it provides:

SMOOTHER OPERATION, because with nearly perfect fuel distribution provided by fuel injection, the power impulse from each cylinder is the same, with all cylinders doing an equal share of the work. . . . GREATER ECONOMY, because each cylinder gets the same amount of fuel, all cylinders can be leaned out uniformly for better economy. This means lean out does not stop, as it does with a carburetor, when the leanest cylinder begins to get rough while all the others could still be leaned further. Instead, each cylinder can be leaned out to its maximum. . . . INCREASED RANGE is obtained by accurate fuel consumption predictability. There is a new gauge on the instrument panel, calibrated to correlate injection system pressure with fuel consumption in gallons per hour. . . . INCREASED HORSEPOWER is developed with no change in engine displacement because the carburetor and its restriction to air flow are removed. The engine is allowed to "breathe" freely. . . . LONGER SPARK PLUG LIFE is attainable because an equal amount of lead reaches each cylinder. All aviation fuels use lead as an additive and if it is not uniformly distributed to all cylinders, any one cylinder can become loaded with lead, causing the plug to foul while the other plugs receive less than their normal share and could run considerably longer before requiring attention.

BETTER ACCELERATION can

Continental Fuel Injection Questions And Answers

Q. Should fuel pressure be set by gauge in the 55% or 65% range? A. Yes — gauge is marked with proper pressure range for per cent of power shown. High side of the pressure range should be used for climb. Lower side is recommended for cruise.

Q. How do I lean out during climb? A. Use gauge markings for power being used or lean out only enough to eliminate any power loss.

Q. How do I lean out for take-off at high altitude fields? A. Lean out to fuel pressure gauge markings for field elevation by full throttle static run-up or during initial take-off roll if runway conditions permit.

Q. How do I lean out at full throttle, 2,600 rpm.? A. Set fuel mixture to the same gauge markings used for altitude take-offs.

Q. How about normal let-down and landing at a high-altitude field? A. Maintain proper fuel pressure for the power being used, going to Full Rich upon entering the airport traffic pattern.

Q. How do I set mixture control for panic let-down rate? A. Set mixture control in Full Rich position.

Q. Can I hurt the engine by running too lean or too rich? A. Not at cruise power or below as long as manifold pressure in inches does not exceed rpm. in hundreds.

Q. Why is there a dual pressure switch on the auxiliary pump? A. To provide a low pressure for starting without flooding and for vapor elimination; and to supply a high pressure sufficient for full emergency power.

Q. If Full Rich mixture is right at sea level on a 100-degree day, is it still right on a 0-degree day? A. The Full Rich fuel flow is set for sea level, standard day conditions, and will increase slightly at low temperature and decrease with high temperatures. However, the fuel-air ratio may vary a negligible amount between 0 and 100 degrees.

Q. How will I know if I have a plugged nozzle? A. Engine roughness will result due to a partial or complete loss of power from the cylinder involved.

Q. Does an increase in engine speed increase fuel pressure accordingly? A. Yes, for any fixed throttle position.

Q. Why is there a return line from the control unit to the fuel pump? A. To carry the spill back from the mixture control valve.

Q. Is there any tendency toward vapor lock? A. No. The built-in vapor separator and shrouding the system against engine compartment heat prevent the possibility of vapor lock.

be had with none of the characteristic flat spots just above idle, because the fuel is always right at the cylinder and does not have to come from a carburetor some distance away. . . . NON-ICING OPERATION means the flight hazards of carburetor ice have been eliminated. The refrigeration effect of vaporizing fuel at the carburetor has been removed because there is air only in the manifold — the fuel is at the cylinders. . . . GREATER SAFETY AND RELIABILITY are inherent because of the extreme simplicity, with no running parts except the fuel pump, which is common to carburetor engines. All movable parts which control metering are positively linked together and manually controlled. . . . REDUCED MAINTENANCE results from simplification. There is nothing in the metering circuit to get out of adjustment. The calibration is mechanically fixed and sealed at the factory. The only adjustment necessary is for smooth idle. . . . IMPROVED STARTING is achieved by accurate controlled priming to all cylinders through the injector nozzles. It might be of interest to know that with the many Continental airplanes which have been equipped with injectors during the last 3 years, there have been numerous occasions when airport personnel have started and taxied the aircraft with no knowledge of the injector.

LOWER CYLINDER HEAD TEMPERATURE is obtained. This is possible for two reasons. One is the cooling effect of fuel vaporization taking place in the cylinder head and the other is, all cylinder head temperatures reach a maximum together when leaning out. This means with Continental's fine-finned cylinder heads and fuel injection, less cooling air is required and airplane performance can be improved by reduction of cooling drag. . . . NO CARBURETOR HEAT is required. There is no need for power wasting heat. Dependable power is yours and in the coldest air available for maximum power.

Although there is little resemblance of an aircraft engine to your lawn, a garden hose compared to a built-in sprinkling system will point out a principal advantage of fuel injection over a carburetor. Sprinkling your lawn while standing at a single point with a garden hose will do the job, but water will be wasted and distribution of water over the entire area will certainly not be even. However, a fuel injection system provides each cylinder with just the right amount of a properly proportioned fuel-air mixture to improve power output, provide smoother running and cut down waste from over-rich mixtures to some cylinders, as is the case with a carburetor system. Equally important is the ability of a fuel injection system to properly proportion fuel additives such as tetraethyl lead throughout the cylinders.

The Continental fuel injection system offers more in performance, simplicity, safety, reliability and ease of maintenance than is possible with any other fuel system available. By every measure — acceleration, power, fuel economy, smoothness, etc. — the performance is superior to that obtained with a conventional carburetor. And most objections to ordinary fuel injection systems — complexity, close tolerances and very high cost — have been designed out of the Continental system.

Several other important advantages are gained with fuel injection. There is better acceleration with no tendency to stall after idling because fuel is always present at each cylinder. There is no danger of icing, even without heated induction air. And, best of all, the smoothness is improved at any engine speed.

Continental fuel injection is of the multi-nozzle continuous-flow type which controls fuel flow to match engine air flow. Thus any change in air throttle position, engine speed or a combination of both causes a change in fuel flow in the correct proportion to engine air flow. A manual mixture control and pressure gauge, indicating metered fuel pressure, are provided for precise leaning at any combination of altitude and power setting. Because fuel flow varies with metered fuel pressure, settings can be predetermined and fuel consumption can be accurately predicted. The continuous flow system permits the use of a typical rotary vane pump in place of a much more complex and more expensive plunger type pump. With this system there is no need for intricate mechanisms for timing injection to the engine. By careful design automatic controls are not required, thus eliminating many elements susceptible to maladjustment and to malfunctioning from mishandling, wear, dirt or gum particles in the fuel. It is this hard-won simplicity that has been largely responsible for the fine operating record, the freedom from maintenance and the reliability for the systems in service for the past 3 years.

With no running parts in the entire system, except a typical engine-driven fuel pump, which is a standard part of a carburetor system, Continental fuel injection combines economy, reliability and utmost safety.

(Continued on page 79)

HERE'S THE SWIFT, BEAUTIFUL

SIMPLIFIED CONTROLS FOR FLYING EASE—Interconnected rudder and ailerons let you fly the Tri-Pacer with wheel alone, or feet alone—a great convenience in long cross-country flights. Designed to make flying simple for the novice, the Super Custom Tri-Pacer also appeals to experienced pilots with its complete gyro panel for instrument flight, 12-channel VHF transmitter, VHF receiver, Omni-navigation system, low frequency radio and homing loop.

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160 HORSEPOWER GIVES YOU 134 MPH CRUISING SPEED

NEW Tri-Pacer 160 FOR 1958

THE beautiful *new* 1958 Tri-Pacer 160 flies with 160 horsepower for more speed, better climb, better take-off . . . and gives you all this with greater economy!

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With this more powerful, more efficient Lycoming engine you cruise at 134 miles per hour at 7,000′ with a range of well over 500 miles—over 650 miles with optional auxiliary tank. You get even better climb and finer high altitude performance—features for which the Tri-Pacer is already famous.

Fine *new* styling marks the *new,* faster Tri-Pacer, too. *New* distinctive exterior design, with flow-swept lines, is offered in three beautiful color combinations—Daytona White with your choice of Bahama Blue, Santa Fe Red or Hershey Brown. *New* smart, interior design matches your choice of exteriors. *New* cabin comfort is yours, too, with *new,* more restful seat upholstering and *new,* higher "just-right" rear seat back.

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LYCOMING T53

(Continued from page 37)

is an official from the CAA. Although initial units of the T53 are scheduled for military use, Lycoming is definitely exploring commercial applications and will CAA certify the engine.

The new engine allows, with its low weight, for a higher payload for the same power. The smaller size will make possible an increase in the helicopter cargo area. Because of the bulk of current large piston engines, there is little variety in engine placement — but the turbine can be placed overhead, fore and aft, thus permitting more advantageous placement of the cargo or passenger area.

The decreased weight of the turbine engine will permit radical changes in the practicable size of the helicopter. Multi-engine installations will be more easily accomplished, increasing the safety of the aircraft. Structural design of the helicopter will be less cumbersome, with the lighter turbine engines less subject to vibration, again permitting increase in the size of the ship.

With the free power turbine, as in the T53, the clutch is eliminated in helicopter operation. Reduction of airframe maintenance time is assured with developments of simplified rotor systems made possible by the turbines.

For the helicopter passenger of the future, the turbine has other important benefits. The noise level will be greatly reduced. This has been borne out in operations with the T53 at both Bell and Kaman where a comparison was run between the noise level of the Kaman HOK powered by a reciprocating and then a turbine engine. The noise level of the T53 powered copter was ten decibels lower than that of the same aircraft with its reciprocating engine.

The Lycoming T53 already has 700 hours of running time in the field, approximately half of it in the air. The new look in helicopter design occasioned by the appearance of the T53 is just around the corner.

NEVER COMMITTED

(Continued from page 41)

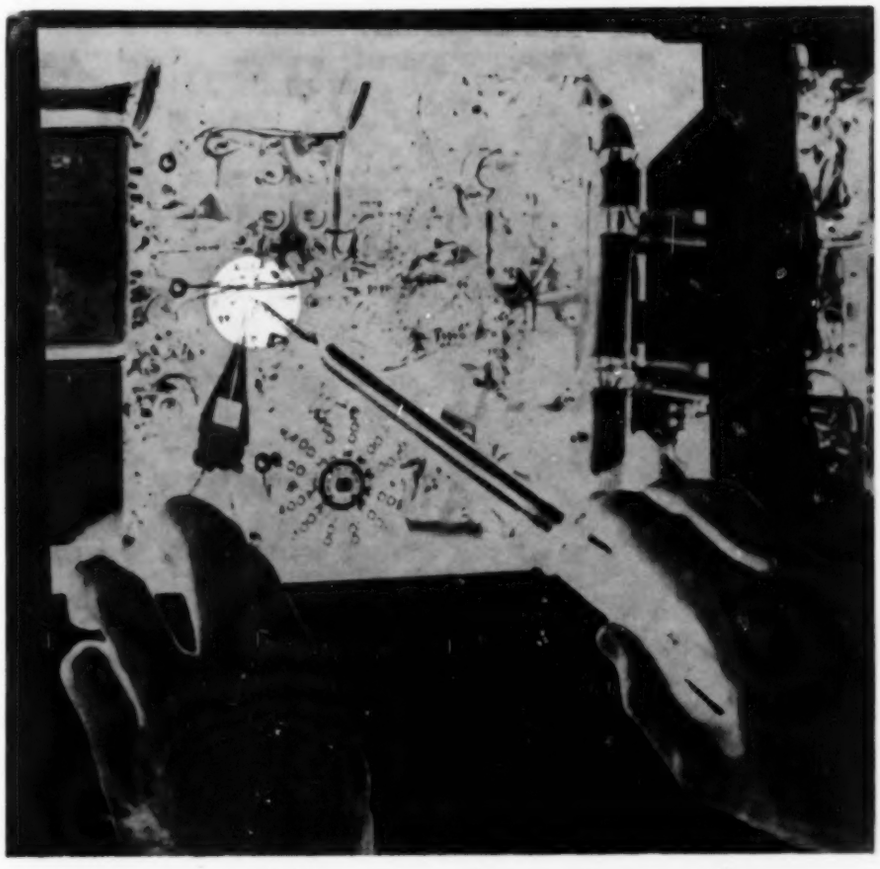
ter, under control of tower, never near busy runways; in a fixed-wing, you must fit in with DC-7's, jets and what-not. After landing at busy airport — fly directly to ramp in a copter, wind's no consequence; long, slow taxi to ramp in a plane, with difficulties from high winds. Tie-down or storage — secure blade of copter, any storage space 7-ft. wide will house a Bell; airplane has three to four tie-down points, ropes or chains a nuisance; large storage area needed.

To top all this off, the helicopter is easy to fly and this fact can be readily demonstrated to any pilot's satisfaction in the new Bell. Fixed-wing pilots agree on this after going through our factory school. Here are the comments of one of them:

By Roderick A. Fraser, President, Aircopter Transport, Orange, Calif.: There is a popular misconception among fixed-wing pilots that helicopters are much harder to learn to fly than fixed-wing aircraft and require special abilities even after the transition period is over. Many fixed-wing pilots who have made the transition actually aid and abet this misconception by telling other pilots of the "Herculean efforts" they had to make to successfully accomplish transition, and I believe this is partially due to an unconscious wish to appear to have done something ordinary people cannot do, and partially because they have forgotten of the difficulties they had learning to fly fixed-wing craft.

I had just under 3,400 hours of fixed-wing time when I entered the Bell helicopter school and would like to make a comparison of my personal experience. It took me over 10 hours to solo in fixed-wing and I didn't feel

(Continued on page 76)



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New exterior paint styling for the 1958 Cessna 172 features a sweeping fin design. The 4-place 172 cruises at 124 mph. and is priced at $8,995.

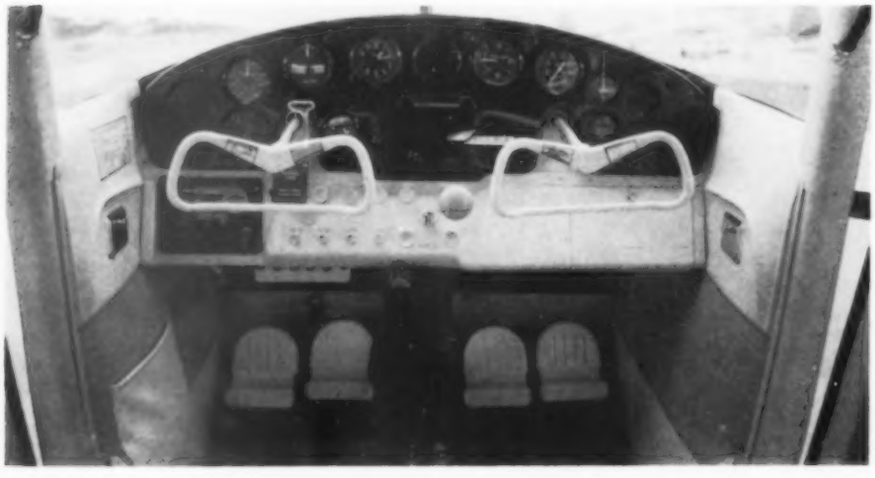
—(Cessna Photo.)

Cessna's New Model 172

NEW and improved interior cabin features new exterior paint trim and relocation of main wheels three inches rearward from last year's model distinguished the 1958 Cessna 4-place Model 172. Cessna has held down the 172 price to $8,995, which is only $20 higher than the 1957 model, despite increased production costs. Other 1958 Cessna models are to be announced later.

Spacious interior with new fabrics (above) and redesigned instrument panel and control wheels (below) are features of the 1958 Cessna 172.

—(Cessna Photos.)



Specifications and performance data remain unchanged from last year. The 172 uses a 145-hp., 6-cylinder Continental O-300-A engine. The factory figures are as follows:

Top Speed, mph.	135
Cruise Performance — Mph.-Mi. Range-Hrs.-Alt.-ft.	124-519-4.2-7,500 97-620-6.4-7,500
Fuel Cap., gals. useable	37.5
Rate of Climb, fpm.	660
Svc. Ceiling, ft.	13,300
Gross Wt., lbs.	2,200
Empty Wt., lbs.	1,260
Useful Ld., lbs.	940
Luggage Cap., lbs.	120
Span-width-length-height, ft.	36-25-8.5
Wing Area, sq. ft.	175
Wing Loading, lbs. sq. ft.	12.6
Pow. Loading, lbs. hp.	15.2

NOTE: Performance is for gross weight at sea level unless noted.

For better handling and stability on the ground, the main landing gear steel-spring struts have been reformed to move the wheels three inches to the rear.

Additional seat adjustments have been provided for front seat comfort and more leg room. Front seats have been redesigned with squared-off backs for improved comfort.

Up front in the cabin, a "T" shaped starter knob and restyled control wheel are used. Instrument panel lighting has been redesigned for better instrument illumination. A map pocket has been added on the left front sidewall. A neoprene seal has been provided on the left front window. A new type control lock is standard.

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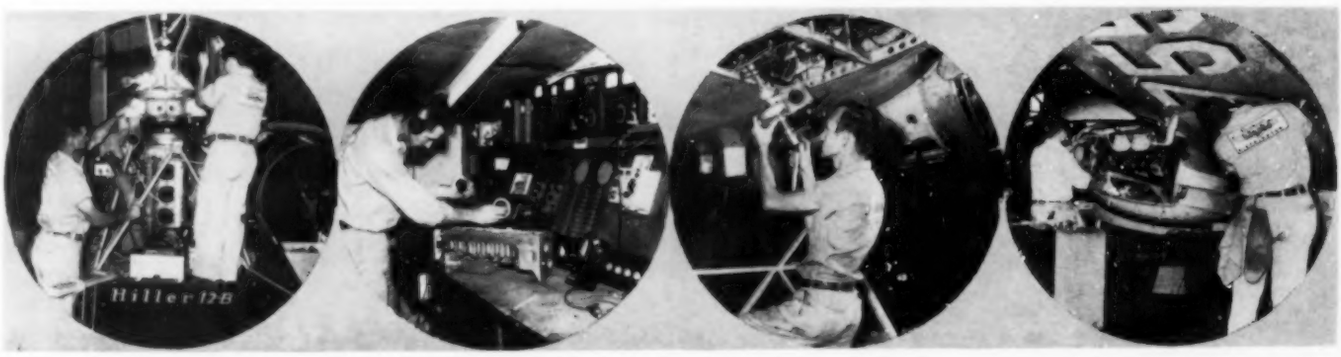

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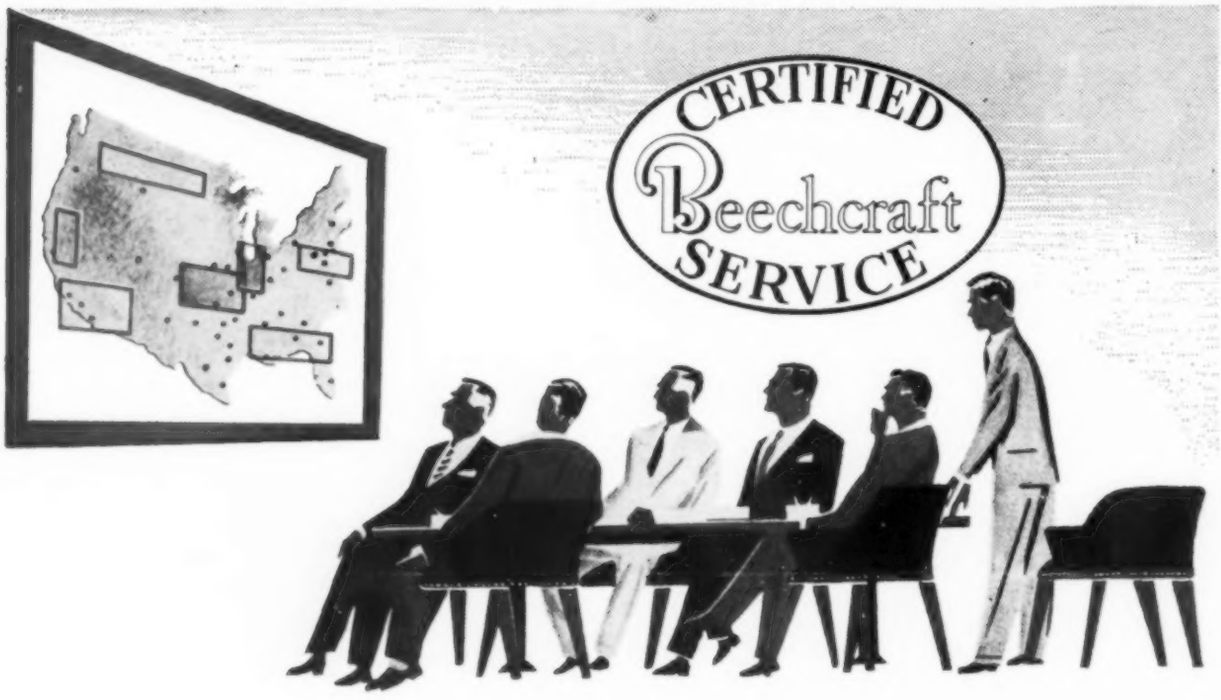

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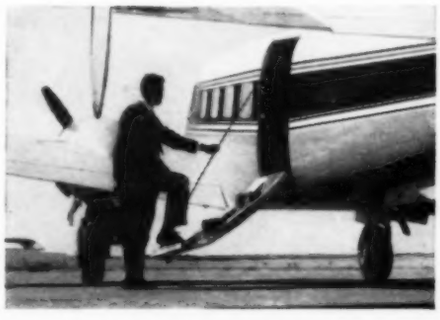

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BEECHCRAFTS ARE THE AIR FLEET OF AMERICAN BUSINESS

Billy Parker's Phillips Petroleum 1912 *pusher (above) and Ken Hunter's Deep Rock Oil* 1917 *Hisso Standard (left) are perfect restorations and gave flight demonstrations.*
—(FLIGHT MAGAZINE Photos.)

Old-Timers' Reunion

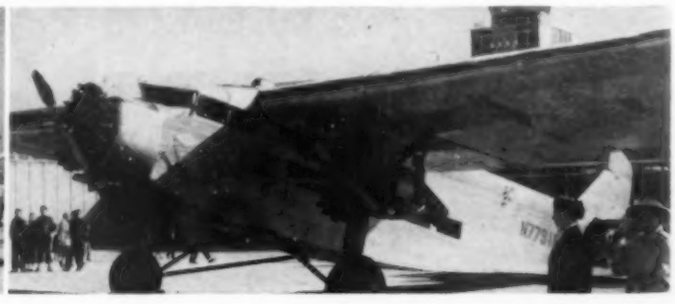
As part of preliminary dedication activities for the new Dallas airline terminal on Love Field, which will begin operations in January, a reunion for old-time pilots and airplanes was held recently. The six beautiful old airplanes shown on this page were among restored aircraft shown at the festivities.

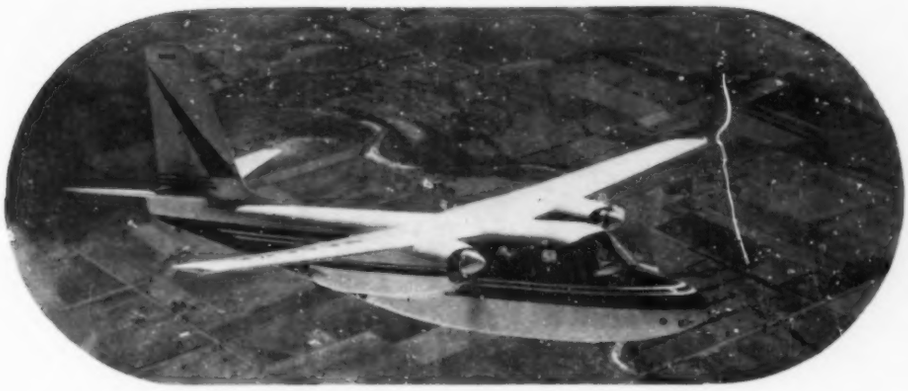
Topping the museum pieces was a 1912 Curtiss pusher restored by Billy Parker, colorful aviation executive of Phillips Petroleum and old-time barnstormer whose license is No. 44. Parker has flown his pusher in many exhibitions. The 60-mph. Curtiss is powered by a 90-hp. OX5 engine and is maintained in perfect condition.

Prettiest of the oldies was a 1917 Hisso Standard exhibited and flown by Ken Hunter, chief pilot for Kerr-McGee Oil Industries, Oklahoma City. In perfect condition and even smelling like it did originally, the 2,925-lb. Standard with 150-hp. V-8 engine cruises at 86 mph. and lands at 34 mph. It has a 4.5-hr. range with 34-gal. fuel supply. The biplane's top wing has a span of 44 ft., the lower wing a 32-ft. span. Length is 27 ft. and height 10 ft. Ken Hunter, the exhibitor, and his brother, John, established an endurance record of 23 days in 1930 with a 1927 Stinson Detroiter.

At the reunion, three pilots were honored for having been flying from Love Field for forty years. They are Billy Parker of Bartlesville, Charles A. (Buck) Rowe of Gulf Oil and Houston, and Burrell Tibbs of Downtown Airpark, Oklahoma City. Miss Lorraine Sanders, long-time director of flight operations for Southwest Airmotive, was designated as sweetheart of Love Field.

Ancient aircraft at the Dallas show included the 1933 *Aeronca C-2 and* 1929 *Stinson Detroiter above and the Vultee V1-A and Ford Tri-Motor transports shown below. Exhibitors were Bill Sistrunk of Beaumont with the Aeronca, Floyd Orrington of Chicago with the Stinson, Lt. Col. E. K. (Sonny) Nolde of Hensley Field, Dallas, with the Vultee and Henry Messer of Houston with the Ford. Sistrunk sold the* 38-*hp. Aeronca after the show to keep from having to fly it home in a strong headwind.*
—(FLIGHT MAGAZINE Photos.)





Seasons Greetings from the folks at BROWN AERO CORP.

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Office Manager

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Local Service Boardings Up 14% In New Traffic Rankings of 376 Cities

By E. H. PICKERING

TRAFFIC boardings by local service airlines at the 376 cities served during the first half of 1957 are running 14% ahead of last year in reports just completed from Civil Aeronautics Board figures. Four cities have had local service suspended since 1956, and sixteen have been added. Traffic increases were reported at 255 points served, 114 showed decreases, and one city boarded exactly the same number in both periods. Total increase was 220,536 passengers to bring local service boardings to 1,862,587 for the 6-month period.

Los Angeles, in moving from 7th to 4th ranking position, and Detroit, in moving up to 8th place from 23rd, showed the most outstanding traffic increases among the larger boarding points. Los Angeles traffic boardings on the two locals which serve it increased by 43%.

Chicago still tops the list with 16% growth and stands likely to be the first city to board over 300,000 local service passengers in a year.

Among cities served exclusively by local service airlines, Utica, N. Y., still leads. Utica increased its boardings by nearly 4,000 passengers in the first six months of 1957 over the comparable period of last year. Ithaca, N. Y. retains second position and Rockford, Ill. takes over third place from Eureka, Calif.

Of 214 points served exclusively by the local airlines, 75, or nearly 35%, showed traffic decreases. Of these, 61 were among those in the lower half of the list, boarding less than 350 passengers per month.

Of the 163 points served jointly with trunk airlines, 39, or 24%, showed decreases, and three-fourths of these were among the cities in the upper half of the list, boarding over 350 passengers per month.

Traffic Record of Cities Served by Local Airlines First Half of 1957 vs First Half of 1956

(From CAB Records)

NOTE: AL, Allegheny; BL, Bonanza; CN, Central; FL, Frontier; LC, Lake Central; MO, Mohawk; NO, North Central; OZ, Ozark; PI, Piedmont; SO, Southern; SW, Southwest; TT, Trans-Texas; WC, West Coast. *Cities served exclusively by local service airlines.

Rank 1st Half, 1957	Rank 1st Half, 1956	City, State and Airline	Passengers Boarded First Half, 1957	Passengers Boarded First Half, 1956
1	1	Chicago, Ill.—NO, OZ, LC	157,985	136,870
2	2	New York, N. Y.—MO, AL	83,924	75,818
3	3	Milwaukee, Wisc.—NO, OZ	47,004	41,909
4	7	Los Angeles, Calif.—SW, BL	37,726	26,466
5	4	San Francisco, Calif.—SW	34,777	29,742
6	5	Pittsburgh, Pa.—AL, LC	34,655	29,024
7	6	Dallas, Tex.—TT, CN	29,439	27,913
8	23	Detroit, Mich.—NO, AL, MO, LC	28,649	14,881
9	9	Washington, D. C.—PI, AL	27,488	22,262
10	8	Phoenix, Ariz.—BL, FL	27,452	24,186
11	15	Minneapolis, Minn.—NO, OZ	26,470	18,091
12	18	Atlanta, Ga.—SO	24,854	16,552
13	11	St. Louis, Mo.—OZ, CN	24,431	20,020
14	13	Binghamton, N. Y.—MO	24,370	19,864
15	16	*Utica, N. Y.—MO	21,467	17,485
16	12	Cincinnati, O.—PI, LC	21,318	20,145
17	17	Denver, Colo.—FL, CN	18,400	16,941
18	19	Seattle, Wash.—WC	18,082	15,981
19	33	Peoria, Ill.—OZ	17,582	11,658
20	10	Tri-Cities, Tenn.—PI	17,260	20,553
21	26	Portland, Ore.—WC	16,528	13,873
22	36	Harrisburg, Pa.—AL	16,078	10,678
23	40	Erie, Pa.—AL, MO, LC	15,895	10,038
24	20	Buffalo, N. Y.—MO, AL, LC	15,391	15,142
25	21	*Ithaca, N. Y.—MO	15,112	15,045
26	39	Houston, Tex.—TT	14,916	10,221
27	27	Memphis, Tenn.—SO, TT	14,825	13,492
28	14	Roanoke, Va.—PI	14,699	18,193
29	25	*Rockford, Ill.—OZ	14,563	14,287
30	35	Las Vegas, Nev.—BN	14,513	10,963
31	30	Madison, Wisc.—NO	14,129	12,026
32	34	South Bend, Ind.—NO, LC	13,462	11,605
33	28	Scranton, Pa.—AL	13,323	13,376
34	22	*Eureka, Cal.—SW	13,314	14,900
35	29	Louisville, Ky.—PI, OZ	13,150	12,686
36	32	Columbus, O.—LC, PI	12,989	11,732
37	45	Monterey, Cal.—SW	12,976	9,595
38	38	*Bradford, Pa.—AL	12,542	10,305
39	50	*Duluth, Minn.—NO	12,123	8,966
40	51	Boston, Mass.—MO	11,569	8,574
41	44	Elmira, N. Y.—MO	11,402	9,780
42	43	Springfield, Ill.—OZ	11,346	9,789
43	41	Indianapolis, Ind.—LC, OZ	11,264	10,005
44	47	*Green Bay, Wisc.—NO	10,936	9,307
48	31	Charlotte, N. C.—PI, SO	10,494	11,869
49	37	Richmond, Va.—PI	10,451	10,309
50	75	*San Jose, Cal.—SW	10,450	6,002
51	48	*Kalamazoo, Mich.—NO, LC	10,210	9,123
52	56	*Oshkosh, Wisc.—NO	9,816	7,564
53	54	Williamsport, Pa.—AL	9,787	7,786
54	46	Huntington, W. Va.—PI, AL	9,750	9,396
55	24	Cleveland, O.—AL, LC	9,330	14,711
56	73	Syracuse, N. Y.—MO	8,929	6,104
57	64	Parkersburg, W. Va.—AL, PI	8,712	6,449
58	67	San Antonio, Tex.—TT	8,705	6,319
59	71	Sacramento, Cal.—SW	8,361	6,129
60	53	Salt Lake City, Utah—FL	8,339	7,870
61	58	Boise, Idaho—WC	8,273	7,371
62	65	*Grand Junction, Colo.—FL	8,219	6,439
63	82	Beaumont, Tex.—TT	7,894	6,611
64	70	Yakima, Wash.—WC	7,810	6,131
65	42	Charleston, W. Va.—PI	7,784	9,882
66	87	Albuquerque, N. M.—FL	7,620	5,181
67	57	Medford, Ore.—WC, SW	7,482	7,462
68	59	Norfolk, Va.—PI	7,326	7,214
69	107	*Farmington, N. M.—FL	7,284	4,014
70	74	Rochester, N. Y.—MO	7,239	6,008
71	79	*Battle Creek, Mich.—NO	7,232	5,696
72	61	*Charlottesville, Va.—PI	7,046	6,667
73	80	Albany, N. Y.—MO	6,876	5,609
74	63	*Champaign, Ill.—OZ	6,373	6,561
75	76	Lynchburg, Va.—PI	6,354	5,975
76	86	*Pasco, Wash.—WC	6,330	5,207
77	66	*North Bend, Ore.—WC	6,250	6,414
78	88	Kansas City, Mo.—CN, OZ	6,235	4,993
79	106	Moline, Ill.—OZ	6,112	4,043
80	60	*Fayetteville, N. C.—PI	6,099	6,849
81	78	Philadelphia, Pa.—AL	6,091	5,866
82	82	Monroe, La.—SO	6,065	5,491
83	83	*El Centro, Cal.—BL	5,912	5,436
84	85	*Decatur, Ill.—OZ	5,839	5,331
85	84	New Orleans, La.—SO	5,793	5,416
86	117	Santa Barbara, Cal.—SW	5,602	3,772
87	89	Grand Rapids, Mich.—LC, NO	5,589	4,992
88	94	*Wausau, Wisc.—NO	5,502	4,587
89	72	Ft. Smith, Ark.—CN	5,498	6,105
90	55	Atlantic City, N. J.—AL	5,479	7,591
91	98	Columbus, Ga.—SO	5,450	4,371
92	52	Ft. Worth, Tex.—TT, CN	5,419	8,105
93	68	Lexington, Ky.—PI	5,386	6,214
94	153	Bakersfield, Cal.—SW	5,340	2,489
95	90	*Yuma, Ariz.—BL	5,222	4,972
96	108	Wilmington, N. C.—PI	5,208	3,990
97	69	Raleigh, N. C.—PI	5,159	6,197
98	92	Spokane, Wash.—WC	5,085	4,650
99	81	Little Rock, Ark.—TT, CN	4,940	5,509
100	104	*Lewiston, Ida.—WC	4,936	4,133
101	122	Walla Walla, Wash.—WC	4,868	3,658
102	49	Watertown, N. Y.—MO	4,753	9,062
103	100	*McAllen, Tex.—TT	4,709	4,301
104	99	Shreveport, La.—TT	4,629	4,355
105	95	Paducah, Ky.—OZ	4,533	4,480
106	110	Hot Springs, Ark.—TT, CN	4,532	3,881
107	123	Joplin, Mo.—CN, OZ	4,406	3,641
108	112	*Lafayette, Ind.—LC	4,349	3,817
109	114	Poughkeepsie, N. Y.—MO	4,244	3,802
110	93	*Tyler, Tex.—TT	4,174	4,589
111	96	Burbank, Cal.—SW	4,150	4,488
112	111	*Greenville, Miss.—SO	4,140	3,821
113	105	Reno, Nev.—BL	4,093	4,066
114	102	*Johnstown, Pa.—AL	4,017	4,199
115	120	*Harlingen, Tex.—TT	4,013	3,701
116	125	*Mansfield, O.—LC	3,942	3,492
117	119	Winston-Salem, N. C.—PI	3,899	3,725
118	109	Corpus Christi, Tex.—TT	3,888	3,930
119	135	*Redding, Cal.—SW	3,888	2,928
120	128	*Beloit, Wisc.—NO	3,836	3,305
121	91	Jackson, Miss.—SO	3,827	4,670
122	137	Oklahoma City, Okla.—CN	3,632	2,879
123	156	Austin, Tex.—TT	3,581	2,375
124	101	Knoxville, Tenn.—PI	3,530	4,206
125	130	*Longview, Tex.—TT	3,506	3,228
126	121	*Bluefield, W. Va.—PI	3,501	3,675
127	77	Billings, Mont.—FL	3,500	5,908
128	115	*Port Angeles, Wash.—WC	3,458	3,709
129	144	Asheville, N. C.—PI	3,425	2,620
130	129	San Diego, Cal.—BL	3,398	3,253
131	103	Jacksonville, Fla.—SO	3,389	4,177
132	142	*Phillipsburg, Pa.—AL	3,304	2,751
133	132	San Angelo, Tex.—TT	3,304	3,150
134	131	*Flagstaff, Ariz.—FL	3,238	3,188
135	146	Youngstown, O.—LC	3,198	2,617
136	158	*Lima, O.—LC	3,188	2,310
137	143	*Columbus, Miss.—SO	3,140	2,708
138	127	Baton Rouge, La.—SO	3,116	3,357
139	118	Tulsa, Okla.—CN	3,053	3,727
140	136	*Chico, Cal.—SW	3,028	2,901
141	148	*Wenatchee, Wash.—WC	3,022	2,580
142	126	Greensboro, N. C.—PI	3,017	3,459
143	149	Terre Haute, Ind.—LC	2,992	2,575
144	159	*Pullman, Wash.—WC	2,988	2,567
145	139	*Columbia, Mo.—OZ	2,963	2,809
146	167	Wichita, Kan.—CN, OZ	2,961	2,154
147	133	Gulfport, Miss.—SO	2,929	3,132
148	165	*Stevens Point, Wisc.—NO	2,834	2,215
149	214	*Hoquiam, Wash.—WC	2,833	1,456
150	138	Oakland, Cal.—SW	2,786	2,844
151	116	*Jamestown, N. Y.—AL	2,741	3,778
152	356	Panama City, Fla.—SO	2,705	19
153	152	Pueblo, Colo.—FL	2,693	2,459
165	124	Ontario, Cal.—BL	2,660	3,591
155	151	Idaho Falls, Ida.—WC	2,655	2,562

Rank 1st Half, 1957	Rank 1st Half, 1956	City, State and Airline	Passengers Boarded First Half, 1957	Passengers Boarded First Half, 1956
156	154	*Tuscaloosa, Ala.—SO	2,640	2,460
157	164	*La Crosse, Wisc.—NO	2,618	2,218
158	168	Wheeling, W. Va.—AL	2,607	2,113
159	174	*Eau Claire, Wisc.—NO	2,605	2,034
160	187	Springfield, Mo.—OZ	2,587	1,818
161	145	*Durango, Colo.—FL	2,552	2,619
162	134	Birmingham, Ala.—SO	2,543	3,024
163	162	*Laredo, Tex.—TT	2,527	2,270
164	179	Pocatello, Ida.—WC	2,522	1,981
165	113	*Altoona, Pa.—AL	2,485	3,814
166	161	*Gadsden, Ala.—SO	2,468	2,274
167	155	Valdosta, Ga.—SO	2,450	2,397
168	169	Lansing, Mich.—NO	2,437	2,113
169	157	*Fayetteville, Ark.—CN	2,428	2,329
170	159	Albany, Ga.—SO	2,423	2,301
171	163	Quincy, Ill.—OZ	2,368	2,249
172	175	*Texarkana, Ark.—TT	2,352	2,028
173	141	Eugene, Ore.—WC	2,347	2,755
174	177	*Victoria, Tex.—TT	2,319	2,004
175	140	*Crescent City, Cal.—SW	2,254	2,770
176	171	*Jackson, Mich.—NO	2,239	2,111
177	92	Casper, Wyo.—FL	2,238	4,447
178	183	*Danville, Ill.—LC, OZ	2,224	1,921
179	184	Lancaster, Pa.—AL	2,205	1,865
180	207	*Santa Ana, Cal.—BL	2,202	1,545
181	189	*Oxnard, Cal.—SW	2,177	1,800
182	147	Lawton, Okla.—CN	2,168	2,586
183	202	White Plains, N. Y.—MO	2,146	1,602
184	190	*Cortez, Colo.—FL	2,119	1,791
185	211	Twin Falls, Ida.—WC	2,100	1,501
186	186	*Riverton, Wyo.—FL	2,076	1,824
187	185	Worcester, Mass.—MO	2,075	1,852
188	194	*Escanaba, Mich.—NO	2,062	1,713
189	198	*Kinston, N. C.—PI	2,045	1,630
190	199	*Marinette, Wisc.—NO	2,043	1,623
191	182	*Prescott, Ariz.—BL, FL	2,040	1,957
192	210	Tucson, Ariz.—FL	2,021	1,518
193	170	*Roseburg, Ore.—WC	2,020	2,113
194	181	*Ephrata, Wash.—WC	2,007	1,972
195	233	*Astoria, Wash.—WC	1,974	1,281
196	188	*Chisholm, Minn.—NO	1,968	1,802
197	172	*Natchez, Miss.—SO	1,928	2,077
198	200	*Santa Maria, Cal.—SW	1,923	1,619
199	178	*Franklin, Pa.—AL	1,871	1,982
200	205	*Rhinelander, Wisc.—NO	1,863	1,570
201	231	Lake Charles, La.—TT	1,846	1,315
202	254	*Athens, Ga.—SO	1,824	905
203	176	Newport News, Va.—PI	1,817	2,026
204	193	*Jefferson City, Mo.—OZ	1,811	1,759
205	341	*Burlington, Ia.—OZ	1,808	224
206	166	Cheyenne, Wyo.—FL	1,764	2,166
207	359	Dothan, Ala.—SO	1,756	7
208	229	*Houghton, Mich.—NO	1,726	1,345
209	241	Lafayette, La.—TT	1,724	1,092
210	346	Des Monies, Ia.—OZ	1,714	140
211	195	*Dubuque, Ia.—OZ	1,712	1,710
212	238	Greenville, S. C.—SO	1,706	1,177
213	196	*Corvallis, Ore.—WC	1,702	1,707
214	208	Dayton, O.—LC	1,699	1,538
215	204	*Bloomington, Ill.—OZ	1,693	1,579
216	221	*Marquette, Wisc.—NO	1,688	1,407
217	227	New Bern, N. C.—PI	1,675	1,360
218	203	Mobile, Ala.—SO	1,667	1,584
219	209	*Salisbury, Md.—AL	1,634	1,537
220	235	*International Falls, Minn.—NO	1,624	1,253
221	268	*Paso Robles, Cal.—SW	1,614	737
222	197	*Hickory, N. C.—PI	1,592	1,639
223	206	Klamath Falls, Ore.—WC	1,572	1,569
224	236	Mason City, Ia.—OZ	1,548	1,248
225	223	*Manitowoc, Wisc.—NO	1,521	1,395
226	230	*Enid, Okla.—CN	1,504	1,332
227	216	*Moultrie, Ga.—SO	1,498	1,431
228	180	*Marysville, Cal.—SW	1,479	1,976
229	213	*Ponca City, Okla.—CN	1,472	1,479
230	201	*Winslow, Ariz.—FL	1,464	1,612
231	222	*Kokomo, Ind.—LC	1,432	1,405
232	191	*Santa Rosa, Cal.—SW	1,407	1,768
233	226	Nashville, Tenn.—OZ	1,405	1,360
234	173	*Hagerstown, Md.—AL	1,384	2,076
235	243	*Iron Mountain, Mich.—NO	1,367	1,080
236	224	*Alamosa, Colo.—FL	1,361	1,385
237	253	*Montrose, Colo.—FL	1,343	907
238	220	*Vicksburg, Miss.—SO	1,337	1,416
239	232	*Vernal, Utah—FL	1,325	1,304
240	212	*Tupelo, Miss.—SO	1,322	1,490
241	269	Grand Forks, N. D.—NO	1,304	863
242	244	Springfield, Mass.—MO	1,285	1,066
243	New	Glen Falls, N. Y.—MO	1,283	.....
244	228	*Gallup, N. M.—FL	1,274	1,360
245	239	*Pine Bluff, Ark.—TT	1,262	1,140
246	217	Bartlesville, Okla.—CN	1,240	1,420
247	New	Cedar Rapids, Ia.—OZ	1,223	.....
248	237	*Williston, N. D.—FL	1 202	1,197
249	234	*Laramie, Wyo.—FL	1,200	1,265
250	218	*Beckley, W. Va.—PI	1,177	1,420
251	245	*Worland, Wyo.—FL	1,162	1,048
252	265	*Marion, Ill.—OZ	1,133	804
253	351	*Ottumwa, Ia.—OZ	1,115	98
254	215	*Borger, Tex.—CN	1,097	1,441
255	248	*Cape Girardieau, Mo.—OZ	1,087	994
256	New	*Marion, Ind.—LC	1,087	.....
257	251	*Ironwood, Mich.—NO	1,084	932
258	246	*El Dorado, Ark.—TT	1,083	1,043
259	New	*Liberal, Kan.—CN	1,079	.....
260	258	*Dover, Del.—AL	1,069	872
261	259	*Marion, O.—LC	1,038	872
262	274	Waterloo, Ia.—OZ	1,024	707
263	192	*Indio, Cal.—BL	1,009	1,760
264	276	Sioux City, Ia.—OZ, NO	1,007	689
265	252	Bismarck, N. D.—FL	994	919
266	240	*Lufkin, Tex.—TT	988	1,110
267	271	*Trenton, N. J.—AL	973	724
268	255	*Bloomington, Ind.—LC	961	887
269	219	*Rock Springs, Wyo.—FL	939	1,417
270	249	Ft. Dodge, Ia.—OZ	928	969
271	250	*Cody, Wyo.—FL	924	935
272	299	Spartanburg, S. C.—SO	898	473
273	277	*Red Bluff, Cal.—SW	889	674
274	269	*Bemidji, Minn.—NO	883	737
275	286	*Ukiah, Cal.—SW	833	589
276	242	Amarillo, Tex.—CN	827	1,087
277	262	Wilmington, Del.—AL	808	841
278	301	Stockton, Cal.—SW	806	447
279	280	*Olympia, Wash.—WC	804	638
280	261	*Laurel, Miss.—SO	801	858
281	284	*Silver City, N. M.—FL	793	603
282	257	*Clarksville, Tenn.—OZ	789	875
283	266	*Richmond, Ind.—LC	789	779
284	275	*Dover, O.—LC	762	704
285	263	Owensboro, Ky.—OZ	756	812
286	264	*Kingman, Ariz.—BL	755	806
287	267	*Clintonville, Wisc.—NO	746	750
288	270	*Blythe, Cal.—BL	736	736
289	273	*Glendive, Mont.—FL	736	709
290	New	Colorado Springs, Colo.—CN	734	.....
291	279	*London, Ky.—PI	733	661
292	281	*Zanesville, O.—LC	718	635
293	247	*Muskogee, Okla.—CN	715	1,009
294	287	*Clinton, Ia.—OZ	685	587
295	310	*Galveston, Tex.—TT	685	391
296	278	*Miles City, Mont.—FL	671	673
297	256	*Duncan, Okla.—CN	668	880
298	294	Pendleton, Ore.—WC	658	512
299	292	*Brainerd, Minn.—NO	652	530
300	251	*Greenwood, S. C.—SO	650	920
301	282	*Coeur D'Alene, Ida.—WC	634	626
302	272	*Brownwood, Tex.—TT	618	710
303	285	*Paris, Tex.—CN	606	600
304	293	*Winona, Minn.—NO	600	524
305	296	*Burley, Ida.—WC	587	485
306	291	*Southern Pines, N. C.—PI	587	533
307	288	*Mattoon, Ill.—OZ	567	570
308	353	Waco, Tex.—TT	547	78
309	313	*Thief River Falls, Minn.—NO	542	376
310	New	Rochester, Minn.[1]—OZ	534	.....
311	327	Keene, N. H.—MO	522	317
312	297	*Camden, Ark.—TT	498	478
313	290	*Stillwater, Okla.—CN	470	544
314	323	*Myrtle Beach, S. C.—PI	469	330
315	New	Omaha, Neb.[1]—NO	448	.....
316	316	El Paso, Tex.—TT	434	357
317	300	*Yreka, Cal.—SW	428	456
318	322	*Powell, Wyo.—FL	423	335
319	305	*Gunnison, Colo.—FL	422	402
320	309	*Monte Vista, Colo.—FL	411	392
321	317	*Safford, Ariz.—FL	388	351
322	302	*Danville, Va.—PI	371	446
323	319	*Beeville, Tex.—TT	365	339
324	225	*Sherman, Tex.—CN	358	1,377
325	295	*Pittsburg, Kan.—OZ	353	491
326	312	*Ontario, Ore.—WC	348	380
327	308	*Easton, Md.—AL	345	393
328	332	*Marfa, Tex.—TT	343	292
329	340	*Rawlins, Wyo.—FL	340	236
330	314	*Magnolia, Ark.—TT	337	376
331	307	*Dickinson, N. D.—FL	318	401
332	315	*Lock Haven, Pa.—AL	303	366
333	318	*Kerrville, Tex.—TT	291	351
334	335	*Marshall, Tex.—TT	290	259
335	324	*Sidney, Mont.—FL	288	326
336	311	*Wolf Point, Mont.—FL	283	382
337	New	*Hazelton, Pa.—AL	270	.....
338	289	*Ardmore, Okla.—CN	265	546
339	321	*Greybull, Wyo.—FL	265	335
340	338	*Pecos, Tex.—TT	263	245
341	334	*La Grande, Ore.—WC	257	269
342	New	Riverside, Cal.—BL	255	.....
343	355	Temple, Tex.—TT	254	53
344	306	Baltimore, Md.—AL	248	401
345	342	*Tonopah, Nev.—BL	240	211
346	325	*Cumberland, Md.—AL	233	325
347	331	*Baker, Ore.—WC	227	295
348	320	*Chehalis, Wash.—WC	225	337
349	336	*Ft. Stockton, Tex.—TT	222	257
350	329	*Clifton, N. M.—FL	207	302
351	330	*Ellensburg, Wash.—WC	206	298
352	New	Toledo, O.[1]—LC	206	.....
353	New	Fargo, N. D.[1]—NO	199	.....
354	298	*Ada, Okla.—CN	197	473
355	343	*McAlester, Okla.—CN	194	187
356	339	*Hawthorne, Nev.—BL	193	244
357	348	*Land O'Lakes, Wisc.[1]—NO	193	116
358	New	*Norfolk, Neb.[1]—NO	191	.....
359	337	Pittsfield, Mass.—MO	183	256
360	344	*Helena, Ark.—TT	165	169
361	303	College Station, Tex.—TT	153	439
362	New	Sioux Falls, S. D.[1]—NO	150	.....
363	347	*Brady, Tex.—TT	133	127
364	304	*Cairo, Ill.[1]—OZ	131	422
365	345	*Gary, Ind.—LC	124	143
366	350	*Morehead City, N. C.[1]—PI	123	100
367	354	*Coleman, Tex.[1]—TT	108	73
368	326	*Cape May, N. J.[1]—AL	94	315
369	New	Brookings, S. D.[1]—NO	70	.....
370	New	Watertown, S. D.[1]—NO	66	.....
371	New	Guymon, Okla.[1]—CN	61	.....
372	352	*Stuttgart, Ark.—TT	54	80
373	357	*Georgetown, Md.[1]—AL	42	16
374	358	*McCall, Ida.[1]—WC	29	9
375	349	*Woodward, Okla.[1]—CN	19	103
376	New	Harrison, Ark.—CN	9	.....
	160	*Auburn, N. Y.—MO	.....	2,295
	283	*Watsonville, Cal.—SW	.....	604
	328	*Ft. Bragg, Cal.—SW	.....	308
	333	*Asbury Park, N. J.—AL	.....	272
		Totals	1,862,587	1,642,049

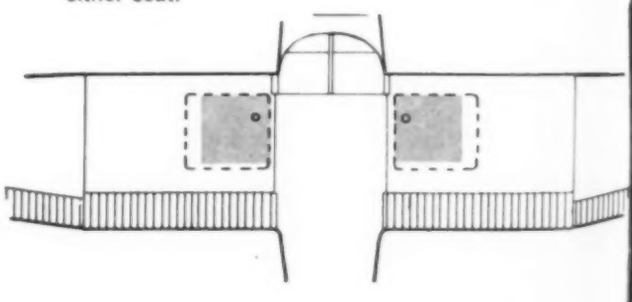
BIG! THE ONLY FULL-SIZE AIRPLANE IN

AND NEW! NEW INTERIOR...NEW COMFORT...NEW

IMPORTANT: The modern design of the larger, roomier, more stable Cessna 172 offers you speeds comparable with other airplanes in the low-price field.

LARGER EMPENNAGE—with control surfaces designed and balanced for immediate, easy response. Cables are located inside structure, reducing drag.

MORE FUEL CAPACITY—42 gallons. Fuel can be easily drawn from one or both wing tanks. Selector valve located between front seats for easy access to either seat.



LARGER FUSELAGE—5 feet longer than any other model in its class. Longer fuselage adds extra stability, extra roominess for passenger comfort on long flights.

Cessna

4 GREAT CESSNAS 172 180 182 310 **THE**

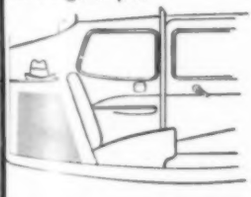
THE LOW-PRICE CLASS

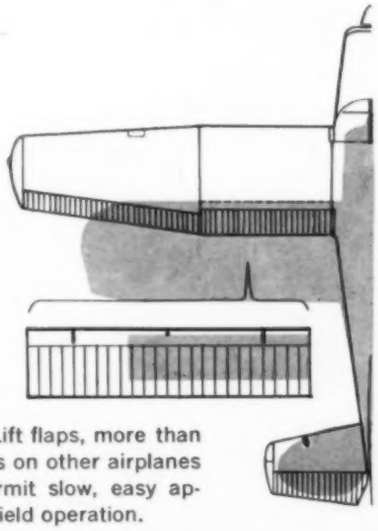
BEAUTY...NEW VALUE FOR 1958

Price: Only $8,995 (with std. equip.) f.a.f. Wichita. Your Cessna dealer will be happy to give you a demonstration in the biggest, most comfortable airplane in the low-price class—the new *all-metal* Cessna 172 for 1958. See Yellow Pages of phone book. Or write CESSNA AIRCRAFT COMPANY, Dept. FM-20, Wichita, Kans.

Inquire about Cessna Lease Plans.

MORE LUGGAGE SPACE—space for 120 lbs., easily accessible in flight or on the ground. Also a utility shelf above the compartment. Rear seat is easily removed for cargo trips.

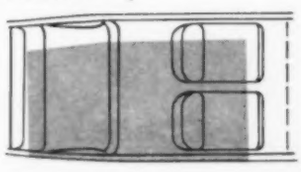




LARGER FLAPS—Para-Lift flaps, more than twice the size of wing flaps on other airplanes in the low-price field. Permit slow, easy approaches and safer small-field operation.

LARGER WING—more square feet of wing area than any other airplane in its class. Extra wing span increases stability, smoothens flight, lengthens gliding distance.

LARGER CABIN—with new interior design, new comfort features, new fabric, new color for 1958. All-metal 172 has two yard-wide cabin doors for easy loading of passengers and cargo.



EASIER TURNING Cessna's famous patented Land-O-Matic landing gear is engineered for ground stability, taxiing, easier landings and take-offs. Includes fully steerable nose wheel and individual toe brakes.

COMPLETE AIR FLEET FOR EVERY BUSINESS NEED

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These Authorized Stations Feature Flat-Rate Service

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Cruse Aviation, Inc.
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and Clover Field Airport
Houston, Texas

Dal-Tex Aviation, Inc.
Highland Park Airport and Love Field
Dallas, Texas

Executive Aircraft Company
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Kansas City, Missouri

Hair Flying Service
Harding Field
Baton Rouge, Louisiana

Poelman Aircraft Co.
New Orleans Airport
New Orleans, Louisiana

Ragsdale Flying Service
Municipal Airport
Austin, Texas

Kenneth Starnes Aviation Service
Adams Field, Little Rock, Arkansas

Southwestern Skyways, Inc.
Municipal Airport
Santa Fe, New Mexico
and Ogden, Utah

Sunny South Aircraft Service, Inc.
Broward International Airport
Fort Lauderdale, Florida

Walston Aviation, Inc.
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East Alton, Illinois

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Wichita, Kansas

SERVICE SATISFACTION

SMILING SERVICE is what you expect and always receive when our Authorized Cessna Service Stations solve your maintenance needs! We furnish factory skills, factory equipment and factory satisfaction. Cessnas are our specialty . . . and we follow a policy of giving Cessna users a little more, a little better service — LIKE OUR FAMOUS 1-2-3 CESSNA FLAT-RATE SERVICE!

1 You get an accurately quoted price and time-required quotation based on hundreds of job studies covering virtually all maintenance needs.

2 You get genuine Cessna parts and factory-trained workmanship.

3 You save money and time and we stand behind every job for your fullest satisfaction.

Grumman Duster-Sprayer

Factory Data

Power: Continental Radial, 220 hp. at 1,750 rpm.	
Gross Wt., lbs.	**3,500**
Empty Wt., lbs.	**2,079**
Useful Ld., lbs.	**1,421**
Hopper Vol., cu. ft.	**29**
Hopper Cap., gals.	**217**
Hopper Ld., lbs.	**1,000**
Fuel, gals.	**34**
Endurance, hrs.	**3**
Oil, gals.	**5**
Top Spd., mph.	**115**
Stall Spd., mph.	**38**
Take-off Run, ft.	**610**
Rate of Climb, fpm.	**540**
Span, ft.-ins.	**35-8**
Length, ft.-ins.	**24-4**
Height, ft.-ins.	**10-9**

NOTE: Performance is for gross weight at sea level and no wind.

Grumman's Ag Plane

A NEW agricultural airplane has been designed by Grumman Aircraft Engineering Corporation, Bethpage, L. I., New York, and two prototypes are being used as demonstrators in a program to test the market potential for a new ag aircraft. Production will be ordered if as many as 100 orders can be obtained and pricing will depend on the market reception, although figures in the $15,000-$18,000 bracket for a small order are being discussed.

The Grumman team doing the demonstrating not only performs whatever maneuvers are requested by interested operators, but invites and urges agricultural pilots to hop in and fly the two demonstrators themselves. Numerous operators tried out the airplanes during the National Aviation Trades Association convention in Dallas last month and all of them liked the handling characteristics of the prototypes, described as being typically Grumman with excellent slow-flight capabilities.

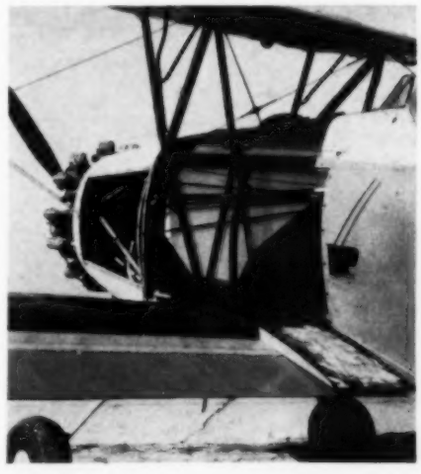
Welded tube structures with sheet-metal panels for easily removable skin are featured in the design, the removable panels giving instant and complete access to all parts of the engine compartment and fuselage for easy cleaning to avoid corrosion.

Although the demonstrators use a 220-hp. Continental, the design will take radials up to 300 hp. A large hopper ahead of the pilot will hold 29 cu. ft. of dust or 257 gals. of liquid and is easily removable. The hopper is limited to a 1,000-lb. load.

The biplane was designed with flaps but excellent flying qualities make them unnecessary and they are inoperative on the demonstrators. Interchangeable upper and lower wing panels reduce spares requirements.

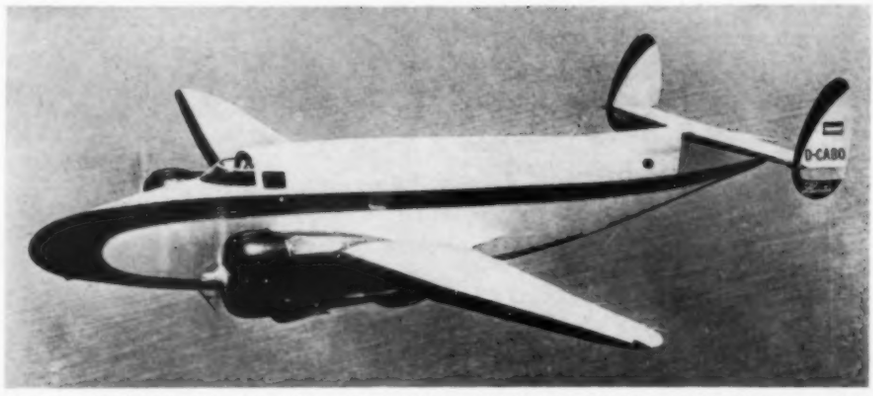
Spring-steel landing gear struts are used and appear to be adapted from the Cessna 195.

The Grumman ag model has light stick forces because of its short span and large, balanced control surfaces. Short take-off and steep climb rate, with gentle stall give it outstanding capabilities for short-field work. It was designed for agricultural work and all surfaces are corrosion-proofed with Furan-base resin paint recommended by Texas A. & M. College from experiments in its ag plane research.



Grumman Pilot Harry De Meo (bottom left) is shown with the new ag plane with two of its many skin panels off. Note large crash-proof headrest behind cockpit, visibility over low nose and wide span of steel-spring gear.

—(FLIGHT MAGAZINE Photos.)



FIRST BUSINESS PLANE TO MAKE TRANS-POLAR FLIGHT was this Learstar delivered from PacAero Engineering's plant in Santa Monica, California, to the purchaser, Helmut Horten, German chain store, Dusseldorf, Germany. It was flown by Hal Herman, left, PacAero chief pilot, and Wilhelm Roemerscheidt, Helmut Horten pilot. Elapsed time from Los Angeles to Dusseldorf, a distance of 6,000 miles, was 23 hrs. 58 mins. One refueling stop was at Frobisher Bay, Northwest Territories. A standard production Learstar, the plane has a 4,000-mile range with 1,340-gal. fuel supply. No special tanks or equipment were used. Vernon B. Benfer, PacAero president, was a passenger.
—(PacAero Photos.)

NATIONWIDE ROUNDUP:

New Business In the Hangar

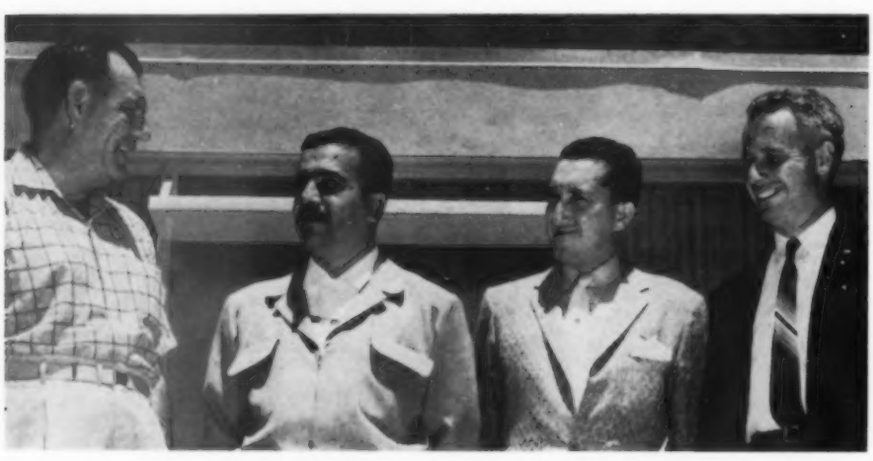
REFRIGERATED AIR CONDITIONING FOR EXECUTIVE AIRCRAFT is now available in the form of single-package units from Air Industrial Manufacturing Co., P. O. Box 7234, Ft. Worth, Texas. Installed total weight, including auxiliary power unit, Edison fire detection unit and CO-2 system, is less than 400 lbs. and cost is listed at $7,500. James T. Crowder of Air Industrial said three years were devoted to perfecting the air conditioner, contained in a single package measuring 35 inches wide, 50 inches high and 19 inches deep. It was designed for Douglas DC-3 and larger aircraft and is known as the "Aim-Air." It operates independently of the aircraft power system for use when the aircraft is idle on the ground or flying. Two refrigeration circuits operate independently, one being capable of maintaining comfort after initial cooling. Combined capacity is 75,000 BTU per hour. With fresh air input of 100 degrees, Aim-Air delivers 900 cu. ft. of 39-degree air per minute within 1.5 minutes after starting and will bring a cabin ambient temperature of 130 degrees down to 80 degrees within 10 mins. Thereafter the load decreases and 70-degree temperature is maintained. Cabinet is stainless steel and auxiliary power unit is 35-hp. 2-cylinder 4-cycle air-cooled engine with remote starting and controls. A brochure is available from the company and the units are available to distributors.

TIMMINS AVIATION, Montreal, has been appointed distributor for the new Grumman Gulfstream turbo-prop executive transport. Other distributors are Atlantic Aviation of Philadelphia, Pacific Airmotive of Burbank and Remmert-Werner of St. Louis, all on an open-territory basis with no boundaries. All are accepting deposits for 1959 deliveries of the Gulfstream, priced at $700,000. The 370-mph. Grumman is powered by two Rolls-Royce Dart RDa-7/2 turbines, grosses 31,000 lbs. and will operate from 4,000-ft. runways.

UPTURN IN EXECUTIVE AIRCRAFT SALES has been reported by William C. Wold, New York specialist in transport sales. An earlier slowdown to buyer resistance has caused a gradual downturn in pricing. He says good airline DC-3's can be had in the $100,000-$125,000 range. Wold's recent sales included National Distillers' B-23 to the H. K. Porter Co., Heussler Aviation's Aero Commander 680 to Indair Corp., and Cluett Peabody's Lodestar to an electronics company in addition to a DC-3 and five DC-4's

INTERNATIONAL MULTIPLE LISTING SERVICE for aircraft sales, similar to real estate multiple listings, is being established by R. Gardner of Aircraft Marketing Co., Los Angeles. Aircraft sales are made through franchise representatives who receive brokers commissions either for obtaining an exclusive listing or selling one of the available aircraft. No charge is made to the owner unless the plane is sold.

EXECUTIVE AIRCRAFT SERVICE, Garland Airport, Dallas, has Red Irwin's Mene Grande Oil DC-3 from Venezuela for Dash 94 engines, two-bottle Jato flush installation, new paint, airframe inspection and interior modifications. . . . Circle Drilling's Cessna 310, Baton Rouge, La., was in



LATEST FAIRCHILD F-27 PROP-JET sale has been made by Richard S. Boutelle (left), Fairchild president, to Linea Aeropostal Venezolana, which ordered six with an option for six more. With Boutelle, left to right, are Antonio Maldonado, LAV president; Dr. Elias Lopez of LAV and Laurance Henderson of Fairchild.
—(Fairchild Photo.)

LEADERS IN PIPER AIRCRAFT'S EMPIRE OF EXPANDING BUSINESS PLANE SALES were honored recently by the manufacturer. Quota Busters are shown above, with top distributors wearing Indian headdress and standing on either side of W. T. Piper. At left is Dave Feltus, Arkansas Aviation Sales, Little Rock, with Mario Lucci, Wallace Aircraft, Sarasota, Florida, at right. Below with Mr. Piper (center) are leaders in his worldwide export network. Left to right are A. Muller, New York; G. Steinemann, New York; R. E. A. Goemans, Paris; C. Brazier, New Zealand; G. White, Canada; Mr. Piper; W. Sawchuk of Piper; R. Armstrong, Canada; W. Atherstone, South Africa; F. Marginson, Australia, and T. Vigors, Ireland.

—(Piper Photos.)

for rebuilding. . . . The United Gas DC-3 from Shreveport was delivered to E. P. (Cotton) Jeter with Maximizer Kit installation. . . . Kenneth Jolley's Texas Gas Transmission DC-3 from Owensboro, Kentucky, was in for 8,000-hr. overhaul. . . . Routine service was performed for Leo Boyd's Tennessee Eastman DC-3 from Kingsport, Tenn.

EAST COAST AVIATION, Bedford Airport, Lexington, Mass., has moved a large 227 by 165-ft. hangar from its site 3,000 ft. to a new location adjoining East Coast's existing facilities. The hangar was acquired from the Hanscom Air Force Base and will add 25,000 sq. ft. of floor space to the company's 40,000 sq. ft. of existing space. It was moved intact on rollers and will be used for aircraft maintenance. The big hangar has a 45-ft. roof and a tower 70 ft. high.

DALLAS AERO SERVICE, Love Field, Dallas, has installed new 3-bladed Hartzell propellers on the Dorsey-Buttram Twin Beech from Oklahoma City. They are said to give the Beech more speed, better single-engine performance, more rate of climb and less noise and vibration. . . . Curtis Voekel's Pacific Northwest Pipeline Lodestar from Salt Lake City was in for double engine change, Janitrol heater installation, complete rewiring, short stacks and 100-hr. inspection. . . . Nose repairs were made to the damaged Cessna 310 of Rhodes Drilling Co., Abilene, Tex. . . . Federal autopilot was installed in the Mississippi Chemical Piper Apache from Yazoo City, Jack Hawks, pilot. . . . The Ross Oil Dove from Miami was in for double engine change with Mark 2 engines and modifications, augmentors, Janitrol heater and gross weight increase from 8,500 to 8,800 lbs. . . . Cosden Petroleum's Dove from Big Spring, Bill Edwards, pilot, received a 1,000-hr. and overhaul for landing gear, propellers and pneumatic system. . . . Fayette Manufacturing Company's Twin Beech was in for Lear L-2 autopilot installation, control surface recovering and routine work.

L. B. SMITH AIRCRAFT, International Airport, reports its aircraft seat manufacturing division, Aerosmith Products, has received contract for airline passenger seating for the new Fairchild F-27 propjet transport. Seats are ultra-light units being built to Fairchild's specifications, which call for high-density seating of 40 passengers per airplane, with seat deliveries on a monthly basis. . . . Aerosmith is completing an 8,500-sq. ft. addition to its plant. . . . Leo A. Strickland has been named comptroller and Erben L. Martin has been named manager of credit and collection for L. B. Smith Aircraft, according to Herrol Bellamy, general manager.

RIMROCK TIDELANDS, INC., oil operator and drilling contractor of Shreveport, La., engaged in offshore and land programs, has received a new Trecker Gull amphibian. Louis I. Ybos, Jr., is pilot for the Gull, used for transportation to and from offshore drilling rigs and other operations.

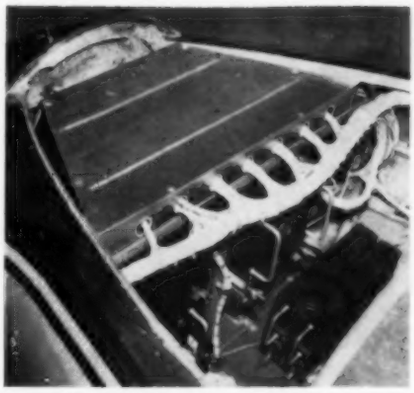
AEROTRON RADIO COMPANY, Hangar 12, Tulsa Municipal Airport, is now available on a full-time basis for Narco DME service. Narco previously listed Aerotron as having limited availability. Full availability means no appointment is needed to obtain DME service.

REMMERT-WERNER, Lambert Field, St. Louis, has installed new lightweight landing gear doors on Floyd Graham's Carrier Corp. DC-3.

. . . Rick Ravitts brought in the Trostel Leather Super Beech for double engine change and oxygen system modification. . . . Bill Haddock was in the Toledo shop with his Swanson Cookie Beech for ARC-1 fifty-channel transceiver and other radio work. . . . Bill Heaton had a 20,000-BTU auxiliary heater installed in the Oil Industries DC-3.

SOUTHWEST AIRMOTIVE, Love Field, Dallas, performed single engine change and 100-hr. for Bill Pruner's Cummins Engine's DC-3. . . . Twin Beech work was performed for E. E. Scott of Anderson Pritchard Oil; Bill Snyder of Department of Interior; Carl Lund, International Paper; Bill Jessup, Permian Mud; Paul Dietz, Helm's Express; and Brian Moss, Atlantic Oil and Refining. . . . James W. Callaway brought in Aviones Commercialies de Guatemala's Piper Apache for 500-hr. inspection and top overhaul.

HORTON AND HORTON CUSTOM WORKS, Meacham Field, Ft. Worth, used a gold plated entrance door step to finalize the interior scheme for Aurora Gasoline's Beech Twin from Detroit, the third Aurora aircraft customized by H. & H. W. E. Slaughter, Aurora president, and his wife selected custom woven wood draperies, green and beige tweed seats, frosted walnut Formica galley



BEECH D18S NOSE HATCH modification and installation, joint project by Associated Radio and Southwest Airmotive of Dallas, provides easy access for maintenance and made possible nose installation by Associated Radio of RCA AVQ-50 radome. Radar components are below removable junction box. Two small units are new Collins marker beacon and glideslope receivers. Project was for Carl Lund, International Paper Co. chief pilot.
(Associated Radio Photo.)

(in former galley area) and green-tinted cockpit and cabin double-bubble windows. Dale Olsen is chief pilot. . . . Gordon Godsall, Godsall Equipment of Toronto, Canada, sent his third Aero Commander to H & H for customizing, a new feature being a complete lavatory room with wash basin, powder table and folding door. . . . A custom interior has been installed in Banco Nacional's new 4-engine de Havilland Heron from Mexico City. Bill Horton was commissioned to do the job by Ian Fossett of de Havilland, according to requirements by Augustin Legoretta. Included are special champagne racks. **ASSOCIATED RADIO** of Dallas installed radio equipment and **DALLAS AERO SERVICE** performed the exterior paint job. The bank's chief pilot, Captain Carlos Borja, and Co-Pilot Daniel Solano took Tex Berry's flight proficiency course while awaiting delivery.

PRIMARY CAUSES in 150 mishaps involving U. S. Air Force aircraft during the two-year period ending June 30, 1957, were failures and malfunctions of brakes, drag chutes, wheels and tires. This was reported during the 31st Air Force-Industry Safety Conference held at Palm Springs last month. The Air Force accident rate is at an all-time low of 14 accidents per 100,000 flying hours.

NEWARK AIR SERVICE, Newark Airport, has been named Cessna dealer for Union and Essex Counties in New Jersey and Richmond County, New York. . . . **DALLAS AERO SERVICE** has appointed B. J. (Johnny) Johnston as service representative to work with customers in all phases of overhaul, maintenance, service and sales. He had been chief pilot for Indian Drilling Mud Co., Oklahoma City.

4 Reasons Why - -

● Photo, courtesy of National Aircraft Corp., Burbank, California, shows their Model NA75 powered by Pratt and Whitney R985 engine.

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PORUS - KROME
Resists Wear, Corrosion and Abrasion of Barrel Bores

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Increases Piston Ring Life Up to 50%

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Airmen's Calendar

Dec. 16-18—Air Traffic Control Symposium, "Mission and Methods of the Airways Modernization Board." For information, write Air Traffic Symposium, Franklin Institute Laboratories, 20th and Parkway, Philadelphia 3, Pa.

Jan. 12-15—Helicopter Association of America 10th Annual Convention, New Western Hills Inn, between Dallas and Ft. Worth.

Jan. 13-17—Society of Automotive Engineers 1958 Annual Meeting, Sheraton-Cadillac and Statler Hotels, Detroit.

Jan. 20-Feb. 7—Two-week Short Course, Aviation Institute for Commercial and Business Pilots, University of Southern California, Los Angeles.

Jan. 22-26—International Air Show and Exposition, Masters Field, Miami.

Jan. 29-31—4th Annual Meeting, American Astronautical Society, Engineering Societies Building, New York.

CAPITAL AIRLINES HAS ORDERED NARCO SAPPHIRE communications radios for its entire fleet of DC-3's. The Sapphire 1016 unit will give the airline 360-channel transmitters and 560-channel receivers. This unit is also used in Capital's Constellations and DC-4's.

UNITED AIRPLANE SALES, INC., is the new name of the Beechcraft distributor at the Wichita, Kansas, municipal airport, according to Ralph Floyd, president and general manager. It was formerly Aircraftco, Inc., which was purchased last May by a group of businessmen and reorganized. Another firm on the same field has a name similar to that of United's predecessor but is not associated with United Airplane Sales in any way. In addition to Floyd, United's vice president and treasurer is Jack McArthur. Sales are handled by William (Bill) Jamison and Bill Fry. United offers complete one-stop custom aircraft service including maintenance and overhaul, radio and avionics, training including instrument flying and one of the largest parts inventories of any aircraft service organization.

FIRST EXECUTIVE DE HAVILLAND HERON in Mexico has been delivered to Banco Nacional of Mexico City with custom interior by Horton and Horton of Ft. Worth. Agustin Legoretta (seated), president of the bank, and his chief pilot, Capt. Carlos Borja, are shown with Dorthe Horton, the aircraft interior specialist.

—(Horton & Horton Photo.)

FLYAWAY DELIVERIES FOR FOREIGN-BOUND CHAMPION TRAVELERS were made recently from the Champion Aircraft factory at Osecola, Minnesota. Two were flown to Chile, one to Argentina and the fourth to Canada. The Chilean planes were factory-equipped with high-performance sprayers including tanks and nozzles.

NEW GLIDAIR 17-A

prevents icing, makes marginal weather operation safer!

Introduced just over a year ago, GLIDAIR 17-A Ice Repellent has become an instant favorite with private flyers and pilots of small commercial or company-owned planes.

They report that GLIDAIR 17-A sprays on quickly, polishes easily to a smooth, glossy surface that helps maintain full prop efficiency, prevents ice formations on struts, leading edges and antennae.

Be sure you have a handy 16 oz. spray can of GLIDAIR 17-A Ice Repellent in your plane for use before flight when icing conditions are possible. It's available from most private operators or write for the name of the nearest distributor.

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New GLIDAIR Windshield Cleaner

Restores clarity to marred or checked plastic windshields and windows. Easily applied with soft cloth—polishes smooth after drying. Repeated applications actually remove fine mars and scratches. Available through most private operators in a 9-oz. unbreakable plastic bottle.

JUST AMONG OURSELVES

(Continued from page 19)

They find that many of their salaried engineers as well as some production people have had previous teaching experience. Others have been found to have college degrees and considerable teaching ability without teaching experience.

It is a simple down-to-earth, share-the-talent type of thing that is typically American. It doesn't require a long, drawn-out Federal plan and millions in Federal aid. It is the only solution that can be applied now, tapping a wealthy resource of teaching talent immediately available.

The record of our aviation industry in scientific and air-age education hasn't been much to brag about. The industry has been notoriously absent when the call went out for help in youth education. Scholarships have been given here and there but many of these have gone by the wayside because there were no takers. Air-age educational programs have operated on starvation diets.

What a significant national service the industry could provide if the Temco plan were universally applied! But it need not be done on a purely altruistic or patriotic basis because the future returns from a trained manpower standpoint and the implications from a community relations standpoint could not be measured! We are confident that if the aviation industry takes the lead in this practical approach to one of the most serious national problems, then, by the fall of 1958, many other industries would follow. By providing scientific training to the oncoming generation we'll help close the widening gap between U. S. and Soviet technology. There's no time to waste.

Commercial Prospects for 1958

WHILE the day of order-taking is definitely over in the utility aircraft market, 1958 might well be a better year both in dollar and unit volume than 1957. Hard selling campaigns by the factories with all sorts of come-ons and rewards for the productive salesman will be launched early in the year. One leading manufacturer openly admits that he is out for 50 per cent of the business next year. The leading commercial helicopter maker is out to double 1957 sales. Competition will be keen all along the line.

Sales of utility airplanes for 1957 will approximate 6,200 units with a retail value of about $133,000,000. When you consider that five years ago a little over 3,000 airplanes were sold for a value of about $35,000,000 there certainly is plenty of reason to crow over progress in the field of civil aircraft utilitization. A large measure of this progress has come from the introduction of the high-performance twin-engine executive aircraft which are doing so much toward taking the progressive American businessman off the ground and putting him into the air where he belongs.

More and more bargain hunters are beginning to show up and a dominant factor in the 1958 market certainly will be in the matter of trade-ins. The up-grading replacement market will still be one of the most substantial sources of new aircraft sales. Making the right kind of trades and being able to turn used equipment might well spell the difference between profit and loss in the distribution end of the business.

It is generally agreed that the utility airplane industry needs more productive salesmen. Considerable progress

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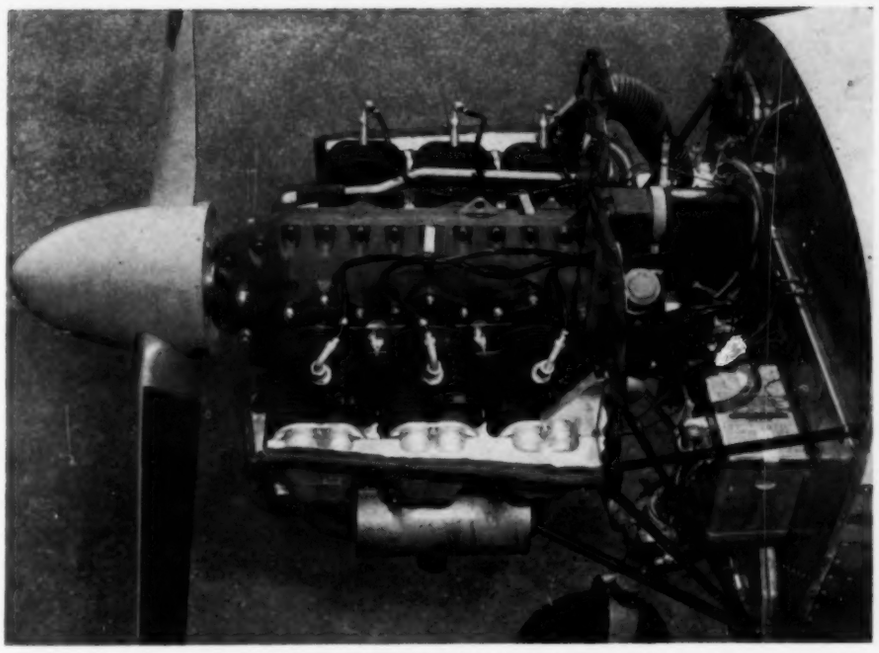
has been made by the principal manufacturers and a few alert distributors in smoking out companies and individuals who need and can afford airplanes but have never considered purchase. This kind of marketing is the toughest of all — first finding the new prospect who can buy and then trying to sell him a machine no one has ever even suggested he investigate.

At least one new and possibly two two-place designs will go on the market later in the year. They will not be "cheap" airplanes and certainly will not produce handsome profits either for the distributor or the manufacturer. However it is encouraging that this vacuum in the market will be filled because we definitely need two-place designs as a starter for the new crop of pilots coming along who, as history has taught us, will graduate into the larger and faster airplanes as their experience and business growth curves go up.

Several four-place Morane-Saulnier pure jet airplanes will be offered for sale by Beech in 1958. This will be the first CAA certificated jet airplane in history and though the volume is negligible the introduction of the pure jet four-seater in 1958 certainly foreshadows things to come.

All in all 1958 should be an interesting and productive year. Many of us would like to see 10,000 units go into American industry, business and agriculture. But the hard-nose realists will be content with the steady evolutionary trend upwards with perhaps a fifteen to twenty-five per cent increase as a definite possibility and completely dependent upon the sales effort put out. There are so many fine models to choose from in every horsepower and performance range the buyer should have a field day. With the certainty of taxes remaining high, the progressive businessman will go first class — by air. Competition in 1958 should certainly guarantee the fact that a lot of businessmen are due for lots of calls, some hard-sell approach and convincing demonstrations.



CLEAN AND ACCESSIBLE POWER PLANT INSTALLATION on the 1958 *Cessna Model* 172 *shows the* 145-*hp. 6-cylinder Continental engine completely uncowled with propeller and spinner installed. Note nose strut attachment at firewall.*

—(Cessna Photo.)

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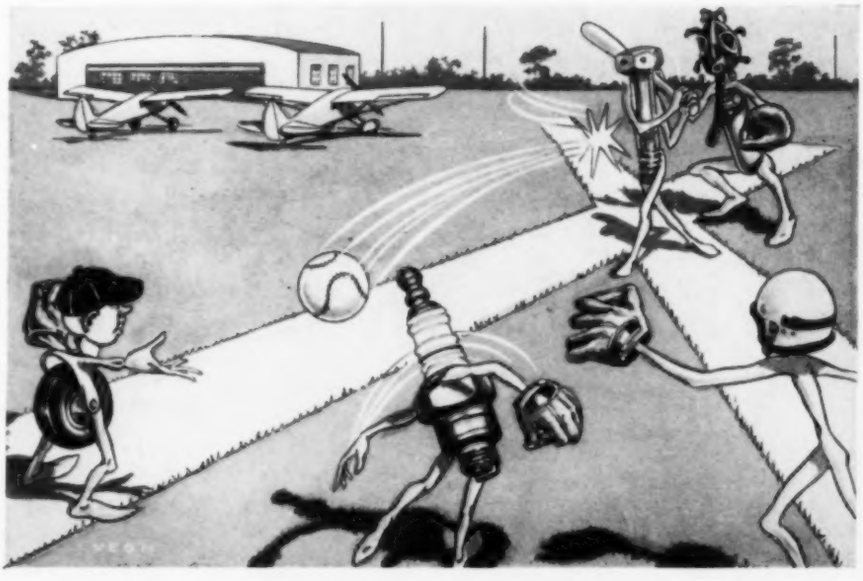

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COMMERCIAL COPTERS

(Continued from page 31)

it easily removable. No extensive oil or ignition system is required. This means easier servicing and maintenance.

During the early part of 1957, Vertol began ground testing its tilt-wing VTOL (vertical take-off and landing) research aircraft, which uses one Lycoming T53 turboshaft engine for power. This aircraft underwent extensive ground testing before entering a flight test program to explore the radically new design concept.

Vertol has utilized the service experience of over 100,000 hours of H-21 flight to simplify the installation of twin turbines in the present airframe.

The twin T53 or T58 turbines could be mounted side-by-side on a welded tubular steel frame that will also support the mixing gear box, the cooling blower and oil coolers. This engine package could be installed the same as the present piston engine, by removal of the engine access doors and the removable keel.

The mixing gear box combines the power from both turbines into a single output shaft. Different mixing boxes would be required to reduce the different rotational speeds of the T58 or the T53 to the desired 2,700-rpm. output. The present transmissions, with comparatively few modifications, could be used. Some other modifications, such as length of drive shaft to accommodate engines, will be required.

Moving rapidly ahead on the H-21 turbine program, Vertol Aircraft Corporation flew both test aircraft from its flight test facility at Philadelphia International Airport to Fort Eustis, Virginia, on November 24 to take part in an Army Transportation symposium. This was the first time a twin-turbine powered helicopter had made such a long cross-country flight.

Sikorsky Activities

Sikorsky Aircraft produces the widely-used heavy-hauling S-58 helicopter, powered by a 1,525-hp. piston engine and having a 5,140-lb. useful load at a 12,700-lb. gross weight. For helicopter airline use and corporate operations it has 12 to 14 seats.

The S-58 is the workhorse among commercial helicopters and deliveries of the $253,000 machine were made during 1957 to New York Airways, Chicago Helicopter Airways, numerous oil companies and commercial helicopter charter operators for use around the world.

Sikorsky also produces the smaller 12-seat, 600-hp. S-55 and it is widely used as a workhorse. The $151,000 S-55 has a 2,312-lb. useful load at a 7,500-lb. gross weight. It cruises at 91 mph. as compared to the S-58's 101 mph.

The Sikorsky factory began flight tests early in 1957 with an S-58 modified with the installation of two General Electric T58 gas turbines. It has been expected that Sikorsky would offer a T58 kit for retrofitting the turbines to commercial S-58's, but the Sikorsky sales department as yet has no plans for this project.

The firm's military twin-engine S-56, powered by two R-2800 piston engines, this year set a new speed mark for helicopters by flying at 162.7 mph. to break the 1954 record established by a turbine-powered Sikorsky S-59 experimental copter. A Marine HR2S version of the S-56 set the new mark and also established new altitude-with-payloads records of 7,000 ft. with 13,250 lbs. and over 12,000 ft. with 11,050 lbs. An Army H-37A version of the S-56 completed 1,000 hours of flight test in less than 6 months at the Transportation Aircraft Test and Support Activity, Ft. Rucker, Alabama, as a "first" for military copters. Both the Army and Marines announced or-

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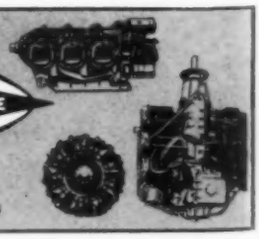
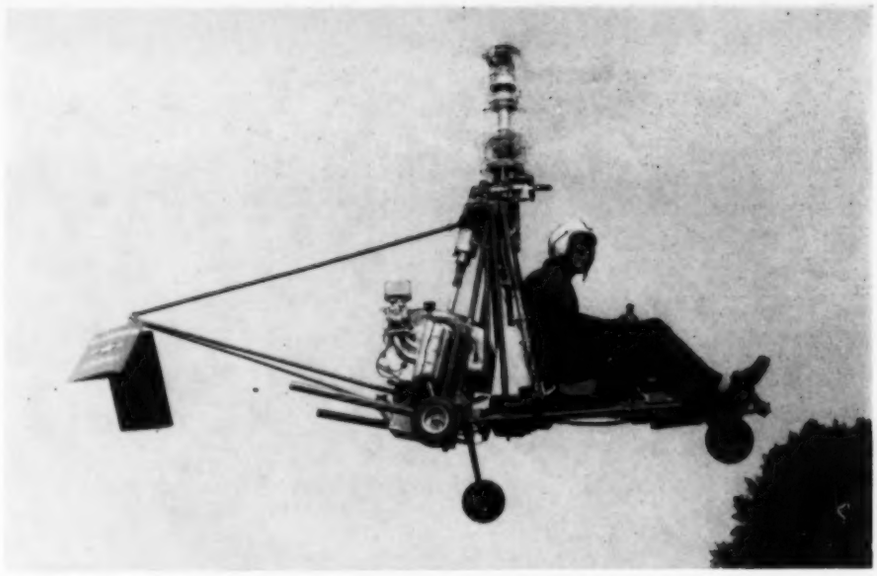


ganization of S-56 transport units, this machine being capable of carrying 36 fully-equipped troops or equivalent cargo.

Commercial operators using Sikorsky helicopters include Osterman's Aero at Stockholm, Sweden; Sabena Belgian World Airlines; Kenting, Ltd., in Canada; World-Wide Helicopters in New Guinea; Los Angeles Airways; New York Airways; Chicago Helicopter Airways; Humble Oil and Refining Co.; the California Company; Petroleum Helicopters; Okanagan Helicopters; Grumman Aircraft Engineering Corp.; Sperry Gyroscope Co.; Continental Oil Co., and Aero Service Corp.

Hiller Helicopters, Palo Alto, California, is now delivering H-23D's to the Army for training, liaison, mapping and other utility missions. The "D" has a completely new drive system designed for 1,000 hrs. between overhauls. During the summer an H-23D completed a 1,000-hr. accelerated ground endurance test. With a 250-hp. Lycoming engine, the "D" can accommodate engines having greater power, Hiller says.

Kaman Aircraft Corp., Bloomfield, Connecticut, is developing its new T-58 turbine-powered HU2K-1 utility helicopter for the Navy. It will emphasize high performance. Kaman recently received an Air Force order for production of H-43A and H-43B crash-rescue helicopters. Initial H-43A deliveries will be powered by Pratt & Whitney R-1340 piston engines. Later deliveries will be the H-43B version powered by Lycoming T-53 turbines. Primary purpose of the crash-rescue machines will be to carry fire-fighting equipment and rescue crews to reach downed aircraft quickly.



GYRODYNE COMPANY'S XRON-1 ROTORCYCLE for the Navy is one-man copter powered by a 60-hp. German-Built Porsche 1600-cc auto engine driving coaxial rotors. Useful load is 290 lbs. at 640-lb. gross weight. Built by Gyrodyne at St. James, L. I., New York, the XRON-1 has 55-mph. cruise, 65-mile range and 12,000-ft. service ceiling.

—(Gyrodyne Photo.)

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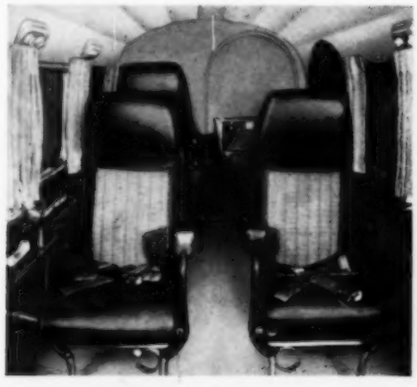

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(Continued from page) 55

ready then. I soloed in 5 hours in the helicopter and felt ready to solo at 3 but my instructor spent the extra time giving me emergency autorotations under a great variety of circumstances, simulating engine failure in a hover just after take-off, on the low-altitude take-off run, on low downwind turns necessitating a crosswind landing if altitude and circumstances allow, and from altitudes of 400 ft. and up.

I believe a fixed-wing pilot has an air-wiseness that is a great aid in learning to fly a helicopter. He knows how to hold headings with allowance for crosswinds in pattern work, he knows how to hold altitude in precision work, he knows how to take in the instrument panel at a glance, he knows how to make corrections as he glances about.

A helicopter is the safest practical means of aerial transportation in the world today — because landings can always be made at zero ground speed unless it is an emergency and the rarity of emergencies is shown in the fact that in 3½ years of student operations at Bell, the factory has not lost a helicopter, the nearest thing to an accident being a student who ran out of gas just short of the landing area. He successfully made a safe autorotation landing. Rigid maintenance inspections and mandatory overhauls account for the rarity of mechanical failure.

Autorotations are safer than forced landings in fixed-wing airplanes because the helicopter pilot can spot his landings much closer and nearly always make ground contact at very slow ground speed. Another important factor is that most fixed-wing pilots get very few forced landings in training due to the time involved in forced landing procedure. Very seldom does the fixed-wing pilot actually make ground contact in forced landings. But in copters, many complete ground contact autorotations can be made in an hour of training, with the result that the average helicopter trainee is vastly more capable of handling an emergency than a fixed-wing trainee.

I would also like to point out that helicopter transportation is also a great pleasure. This is the comment of everybody who has ridden with me. From a Bell you can see everything. If you want a better look, just slow down or stop and hover and have a real good look. As a pilot, I have never enjoyed flying as much as I do when flying a copter. It is just plain wonderful to fly, wonderful to ride in and is the most versatile form of transportation man has yet devised. But it isn't a dream — it is here today, available right now.

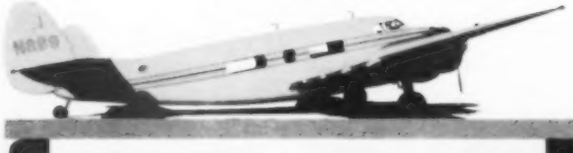
HELIPORT CRITERIA

(Continued from page 43*)*

a very excellent heliport may be partially surrounded by tall structures to the extent that a straight 1-to-8 unobstructed approach zone does not exist. The use of a curved approach in this instance may be entirely practical. A turning radius of 600 ft. is reasonable for a curved approach zone.

It is convenient but not always necessary for a helicopter to make its approach into the wind — approaches and take-offs can be made crosswind. Therefore approach zones from all directions are not a requirement. There should be at least two approach zones, aligned to take best advantage of prevailing winds but always consistent with the necessity of avoiding obstructions. The approach zone should fan out from the outside heliport dimensions to a maximum width of about 1,000 ft. Ten degrees is recommended.

Regarding obstructions outside the approach zones but close to the heliport, minimum distance of 25 ft.



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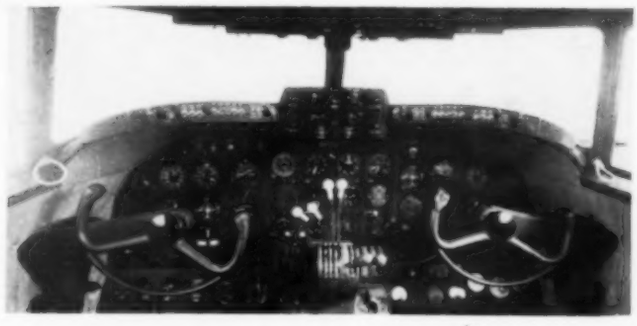

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from the fence is satisfactory for obstacles of rotor height. This may be expected on roof-top locations, where there may be ventilators, chimneys and other obstacles near the landing area. This minimum distance need not apply to objects which are not tall enough to be struck by the rotor blades.

Moderate turbulence from nearby tall structures will not necessarily limit operations but it is desirable to select a site where there are few if any "turbulence creating" obstructions adjacent to the heliport. It should be remembered that a roof-top heliport can have the advantage of rising above surface turbulence.

Access Routes

In the interest of increased safety, it is suggested that whenever possible the selection of a heliport be based on the availability of an access route offering the maximum in emergency landing areas along the route, these areas usually being available along railways, expressways, rivers, canals, parks and the like.

There is no more reason to provide special emergency landing areas near a heliport than there is to provide emergency airplane landing fields adjacent to airports for fixed-wing airplanes. In fact, the helicopter has the distinct advantage of its capability of landing safely in small areas in the unlikely event of power loss.

Using CAA data for the Bell 47J at 2,800 lbs., the autorotation glide slope in zero wind is in excess of 5:1. With a 20-mph. wind, this glide slope is reduced to a ratio in excess of 3:1. Therefore the use of a 3:1 glide ratio is suggested in determining the distance between areas available for emergency landings, these distances depending upon cruising altitude. If, for example, an enroute minimum cruising altitude of 700 ft. is selected, emergency areas half a mile apart can be safely reached in a glide. A scarcity of emergency areas can be compensated for by operating at a higher altitude, or an abundance of open areas will permit cruising correspondingly lower than 700 ft.

The lack of such emergency areas near a heliport should not necessarily preclude helicopter operations. In taking off, the helicopter hovers just above the surface before departing. More power is required to hover than to fly forward or to climb. Therefore the pilot checks engine operation under high power operation while he is still directly over the heliport and prior to moving away from it with

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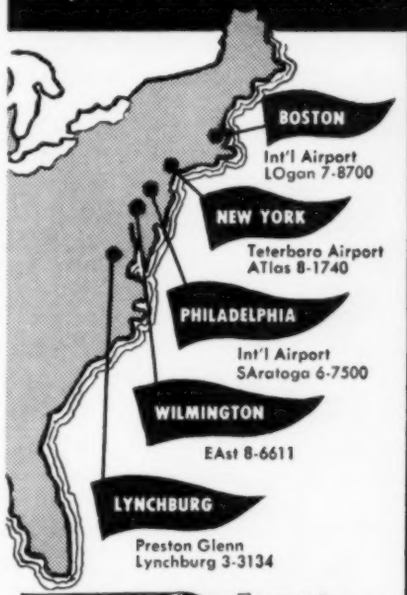

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reduced power. This inherent characteristic of helicopter operations provides a measure of safety unmatched by fixed-wing airplanes. It makes adjacent emergency landing areas unnecessary.

Helicopter traffic in the air along an access route falls properly within the province of the CAA and Civil Air Regulations provide well-established practices and procedures for the control of air traffic by local CAA representatives.

Structural Requirements

The landing pad of an elevated heliport or helistop should be designed to support concentrated loads equivalent to three-fourths the gross weight of the helicopter on any one square foot. Thus, for helicopters up to 3,000-lbs. gross weight, the pad surface should support 2,250 lbs. per sq. ft. Where roof surfaces are not designed for this load, it is common practice to construct a simple pad to distribute the load over a greater area. For example, a 20 by 20-ft. pad will impose an additional average distributed load of only about 6 lbs. per sq. ft. on the roof surface.

General

The downwash from the Bell Model 47 series of helicopters is not severe but is sufficient to blow dust and sand when the helicopter is hovering. Therefore it is suggested that the heliport either be surfaced with crushed gravel, asphalt, metal grates or some such material or that it be sodded with grass. If much ground handling is anticipated, the surface should be reasonably firm. Fencing is recommended but its type is immaterial so long as it serves the primary purpose of keeping unauthorized persons off the small landing area.

There are specific CAA marking requirements for helicopters, designated TSO-N22. In addition to these, the roof-top heliport should be clearly marked to show the maximum load for which it is stressed in terms of helicopter gross weight. This will inform the pilot whether his helicopter can be safely supported by the structure.

Local authorities may obtain fullest available details and suggestions for heliport considerations from local helicopter operators and from the manufacturers. The information in this article was obtained from Bell Helicopter Corp., which is in the process of publishing its own heliport criteria and is working with the industry for the publication of general heliport criteria. Joe Mashman is in charge of Bell's activity in this project.

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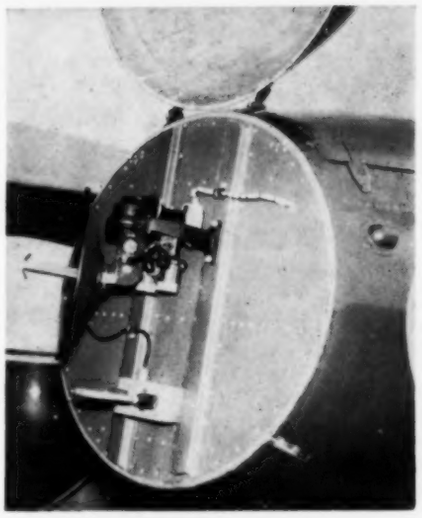
BONANZA FUEL INJECTION

(Continued from page 50)

A very important characteristic of fuel applied to *either* carburetion or fuel injection is the formation of unwanted vapor due to the effects of altitude and high temperatures. As an example: If a climb from sea level to 15,000 ft. is made with 20 gallons of 100-degree F. fuel, the natural formation of vapor in the tank and lines could amount to approximately 160 gallons. This vapor must be removed from the fuel system to insure that only liquid fuel is delivered to the engine. Fortunately, there is not time for all of this vapor to form because of the cooling effect of vaporizing gasoline and the reduction of outside air temperature with altitude. The vapor that remains is vented to the atmosphere and only the vapor in the supply lines must be expelled or solidified before entering the fuel pump. An increase of supply pressure by the boost pump will collapse all the vapor back to liquid. For those relatively few occasions where the built-in vapor separator is faced with more volume than it can remove, the brief use of the auxiliary pump will suppress the vapor formation. An important feature is that the Continental fuel injection system is carefully designed for maximum freedom from vaporization effects. The auxiliary pump also provides an alternate source of fuel pressure for the injection system for maximum safety. In the event of a fuel pump failure the engine can be operated at cruise or full power on the auxiliary pump alone.

A new gauge has been added to the instrument panel. It is not necessary for flight operation but is placed there for your convenience. It serves the same purpose as a fuel flow meter would do when used in conjunction with a carburetor. It would tell the rate of fuel consumption in gallons per hour. But you fly a carburetor without a fuel flow meter and you can fly the injector without this gauge. However, because of the additional control and convenience that is possible through its use we have furnished it. It tells you the pressure in the fuel injection system. From charts furnished in the operator's manual you can obtain the fuel consumption in gallons per hour. It also provides a means of accurate lean-out to specific values for best power or best economy at altitude for any power setting given in the operator's manual. It also provides a means of determining best power settings for take-off at altitudes.



Here's RCA AVQ-50 antenna on Beech D18S. Note glideslope antenna is also on bulkhead. McMillan Radome hinges at top.

Radar for Your D18S By ASSOCIATED RADIO

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2. Cabin Temp, Outside Air and Heater dump temp
3. Oil Temp, Carb Temp and Cylinder Head Temp or any other combination as required by the user.

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BEECHCRAFTS FOR 1958

(Continued from page 48)

Air, Twin-Bonanzas and Super 18 accompany this article.

Sales Leaders for 1957

During the annual sales meeting, Mrs. O. A. Beech, president, and Commercial Sales Managers Leddy Greever (domestic) and Mike Neuberger (export) and other factory officials honored leading sales outlets. Some 80 individual sales awards were made. Highest were for territorial sales exceeding or meeting quotas. For this, new station wagons went to Ira Hartzog, Butler Airplane Sales manager, Chicago; Forest Beckett, Youngstown Airways, Youngstown, Ohio, and Bob Graf, Lang Aircraft manager at Omaha. Runners-up with color TV sets as awards were T. Gail Clark of Tulsair at Tulsa and John M. Erskine, Atlantic Aviation, Boston.

Among distributors, color TV sets went to Vern Casselbury, Blue Grass Airmotive, Lexington; Jack Knudson, Combs Aircraft, Denver, and R. S. Northington, Piedmont Aviation, Winston-Salem, for sales of individual Beech models in the Bonanza, Twin-Bonanza and Super 18 categories, respectively.

Dealers winning $500 bills for sales were Donald Patrick, Patrick Aircraft Sales, Cleveland; Ralph Graham, Graham Flying Service, Sioux City; Miss Delphine Bohn, Western Aviation, Ft. Worth, and Earl Outland, Abilene Aviation, Abilene, Tex.

Salesmen winning $500 bills were Oscar James of Butler Airplane Sales; Ray McGreevey, Youngstown Airways, and R. W. Jeter, Currey Sanders Aircraft, Shreveport.

In the annual distributor parts competition, Southern Airways at Atlanta was cited for best over-all sales performance, with improvement honors going to Gopher Aviation at Rochester, Minn., J. R. Gray Co., Dallas, and Flightcraft, Inc., Portland, Ore.

Beechcraft's leading export distributor for 1957 was Lt. Col. G. de Ruty, owner of Airco, Tangier, Morocco. Fifteen export distributors shared in special bonuses totaling nearly $18,000.

Named to Beechcraft's "Million Dollar Club" for sales exceeding one million dollars in 1957 were 16 dis-

Beech Super 18 for 1958

Factory Data

Powered by two 450-hp. P & W engines

Price	$117,975
Gr. Wt., lbs.	9,300
Empty Wt., lbs.	6,050
Useful Ld., lbs.	3,250
Fuel Cap., gals.	275
Opt. Fuel Cap., gals.	318
Top Spd., mph.-alt.-ft.	234-3,300
Cruising Speed—	
Mph.-hp. per engine-alt.-ft.-mi.	
	215-300-10,000
	205-260-10,000
	199-240-10,000
	182-200-10,000
Cr. Range—	
Miles-mph.-gals.-alt.-ft.	
	1,263-215-318-10,000
	1,074-215-275-10,000
	1,422-205-318-10,000
	1,216-205-275-10,000
	1,497-199-318-10,000
	1,281-199-275-10,000
	1,626-182-318-10,000
	1,388-182-275-10,000
Rate of Climb, fph.	1,350
SE Rate of Climb, fpm.	320
Svc. Ceiling, ft.	23,300
SE Svc. Ceiling, ft.	8,700
Take-Off over 50-ft. obstacle, ft.	1,800
Landing over 50-ft. obstacle, ft.	1,700
Span, ft.-ins.	49-8
Length, ft.-ins.	35-2.5
Height, ft.-ins.	9-6
Wing Area, sq. ft.	360.7
Wing Loading, lbs. sq. ft.	25.75
Pow. Loading, lbs. hp.	10.32
Cabin Dims., length-width-height, ins.	125-52-66
Door, ins.	45.5-26¾
Util. Compt., height-width-length, ins.	57-48.5-28
Bagg. Compt. cu. ft.	24
Bagg. Cap., lbs.	300

NOTE: Performance is at gross weight and sea level unless noted.

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tributors — Southern Airways of Atlanta; Combs Aircraft of Denver; Butler Airplane Sales of Chicago; Youngstown Airways of Youngstown, Ohio; Tulsair of Tulsa; J. R. Gray of Dallas; Lang Aircraft of Omaha; Ohio Aviation of Vandalia; Atlantic Aviation divisions at Wilmington and New York; Norman Larson of Van Nuys; Francis Aviation of Lansing; Anderson Air Activities of Milwaukee; Cutter-Carr of Albuquerque; J. D. Reed of Houston and Topeka Aircraft Sales of Topeka, Kansas.

Frank E. Hedrick, Beech vice president-coordinator, forecast Travel Air sales in 1958 will reach $9,000,000 and reported a combined commercial and military backlog topping $113 million, up $10 million over the backlog for this time last year.

Beech F50 and D50A Twin-Bonanzas for 1958

Factory Data

	Model F50	Model D50A
Price	$88,000	$77,000
TO Hp. at rpm., each engine	340-3400	295-3400
Rated Hp. at rpm., each engine	320-2200	285-3100
Gr. Wt., lbs.	7,000	6,300
Empty Wt., lbs.	4,460	4,090
Useful Ld., lbs.	2,540	2,210
Fuel Cap., gals.	180	134
Opt. Fuel Cap., gals.	230	180
Oil Cap., gals.	8	6
Top Spd., mph.-alt. ft.	240-9,000	214-2,500
Cruising Speeds— Mph.-pct. hp.-rpm.-alt.-ft.		
	228-70-2750-13,000	203-70-2750-7,000
	218-70-2750-10,000	201-65-2750-9,000
	224-65-2750-14,800	194-65-2750-5,000
	212-65-2600-10,000	
Cruising Range— Miles-gals.-pct. hp.-mph.-alt.-ft.-hrs.		
	1310-230-65-212-10,000-6.2	1110-180-65-201- 9,000- 5.5
	1040-180-65-212-10,000-4.9	825-134-65-201- 9,000- 4.1
	1650-230-42-169-10,000-9.8	1650-180-40-160-10,000-10.3
	1290-180-42-169-10,000-7.6	1230-134-40-160-10,000- 7.7
Rate of Climb, fpm.	1,620	1,450
SE Rate of Climb, fpm.	245	300
Service Ceiling, ft.	24,800	20,000
SE Svc. Clng., ft.	11,500	7,000
Stall Spd., Landing, flaps, mph.	80	71
Stall Spd., clean, mph.	90	84
Take-Off over 50-ft. obstacle, ft.	1,250	1,260
Landing over 50-ft. obstacle, ft.	1,840	1,455
Span, ft.-ins.	45-3⅜	45-3⅜
Length, ft.-ins.	31-6½	31-6½
Height, ft.-ins.	11-4	11-4
Wing Area, sq. ft.	277.06	277.06
Wing Loading, lbs. sq. ft.	25.2	22.74
Pow. Loading, lbs. hp.	10.9	11.05
Cabin Dims., length-width-height, ins.	119-54-51	119-54-51
Cabin Door, ins.	36-37	36-37
Bagg. Dr., front, ins.	21.5-19.7	21.5-19.7
Bagg. Dr., rear, ins.	26.5-26.7	26.5-26.7
Bagg. Cap., front, cu. ft.	14	14
Bagg. Cap., rear, cu. ft.	41	41
Bagg. Cap., lbs., front-rear	200-300	200-300

NOTES: F50 is powered by two Lycoming 6-cylinder GSO-480-B1B6 geared and supercharged engines with oil-cooled pistons. D50A is powered by two Lycoming 6-cylinder GO-480-G2D6 geared engines with oil-cooled pistons. Both airplanes are equipped with Hartzell 3-blade full-feathering, constant-speed, hydraulically-controlled propellers. Performance is for gross weight and sea level unless specified and is guaranteed within 3%. Standard empty weights are guaranteed within 2%.

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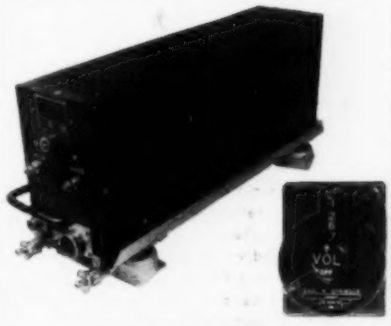

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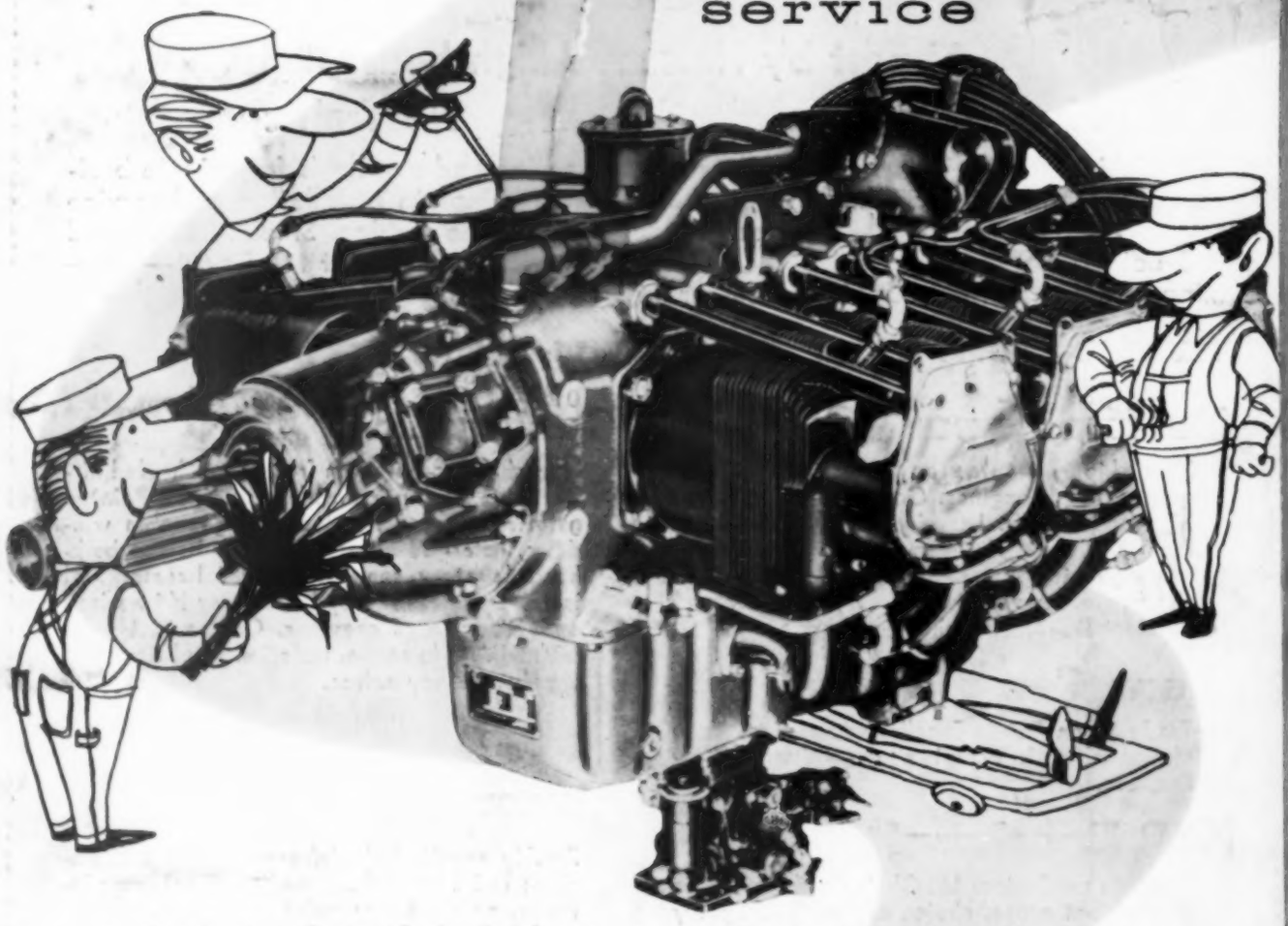

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